

# JOURNAL of the American Veterinary Medical Association

FORMERLY

AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Ass'n.)

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The American Veterinary Medical Association

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**JOURNAL**  
**OF THE**  
**American Veterinary Medical Association**  
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(Original Official Organ U. S. Vet. Med. Ass'n.)

H. Preston Hoskins, Secretary-Editor, 716 Book Building, Detroit, Mich.

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No. 4

**ON TO MINNEAPOLIS**

By the time this issue of the JOURNAL reaches those of our members who are located a considerable distance from Detroit, the sixty-fifth annual meeting of the American Veterinary Medical Association will be in full swing at Minneapolis. It promises to be a history-making and, in all likelihood, a record-breaking meeting.

The official program contains the titles of exactly fifty papers—probably the most comprehensive and best balanced program that has ever been offered those attending an A. V. M. A. convention. A tentative outline of this program was published last month. No material alterations have been found necessary. Several additional subjects have been added, these having been in doubt when we went to press with the July number.

Perhaps the most impressive part of the program is that being offered by the Section on General Practice, with seventeen papers. Supplement this literary symposium in the realm of practice, the results of the efforts of the officers of the Section on General Practice, with the clinical demonstrations to be staged at University Farm, on Friday, under the direction of Dr. W. L. Boyd, chairman of the Subcommittee on Clinics, and the practitioners have a treat that is offered only on rare occasions.

Looking to the business side of things, the program gives only a hint of the vast amount of business to be transacted. It is no

idle jest for us to say that "business is increasing." This fact was strongly reflected in the brief reference made to the recent special meeting of the Executive Board, in the July issue of the JOURNAL. When we got to the point of writing up the minutes of the meeting, we found that it required sixteen typewritten pages to record the transactions.

Seriously, our activities have been expanding at a more rapid rate than any of our members realize. There is serious question as to the advisability of taking more than one-half the time available at annual meetings for the transaction of business.



DR. ROBERT S. MACKELLAR  
Member-at-large, Executive Board

Would it not be possible to delegate a large portion of this business to a small, representative group of our members, and thereby conserve valuable time for the reading and discussion of scientific papers? Scores of members say that they do not like to sit for hours listening to committee reports and the like. The most concrete evidence that we have of this fact is the comparatively small attendance at some of the business sessions. The four business sessions at Philadelphia consumed ten hours all but ten minutes.

On the other hand there are those members who are deeply interested in the purely business side of the organization. They show their interest in more ways than one. Will these members be perfectly content to have a large part of the business of the A. V. M. A. transacted by a relatively small number of members? What is the answer? The time has arrived when we must decide our future course.

### *Minneapolis, City of Lakes and Gardens*

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See May, 1928, JOURNAL

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 Martindale, William Edgar, 1342 Harrison St., Frankford, Philadelphia, Pa.  
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 Woolen, Vergil W., 618 Fifteenth Ave. N., South St. Paul, Minn.

The amount which shall accompany an application filed this month is \$7.08, which covers membership fee and dues to January 1, 1929, including subscription to the JOURNAL.

### COMING VETERINARY MEETINGS

Connecticut Veterinary Medical Association. Bridgeport, Conn.  
 August 1, 1928. Dr. E. H. Patchen, Secretary, Milford, Conn.  
 Chicago Veterinary Society. Great Northern Hotel, Chicago,  
 Ill. August 14, 1928. Dr. J. B. Jaffray, Secretary, 2956 Wash-  
 ington Blvd., Chicago, Ill.  
 Southern California Veterinary Medical Association. Chamber  
 of Commerce Bldg., Los Angeles, Calif. August 15, 1928.  
 Dr. W. L. Curtis, Secretary, 1264 W. 2nd St., Los Angeles  
 Calif.  
 Kansas City Association of Veterinarians. New Baltimore Hotel,  
 Kansas City, Mo. August 20, 1928. Dr. J. D. Ray, Secretary,  
 400 New Centre Bldg., Kansas City, Mo.  
 Hudson Valley Veterinary Medical Society. Kenozia Lake,  
 Kingston, N. Y. August 8, 1928. Dr. J. G. Wills, Secre-  
 tary, 122 State St., Albany, N. Y.  
 Mahoning Valley Veterinary Club. Punxsutawney, Pa. August  
 24, 1928. Dr. R. M. Quigley, Secretary, Tyrone, Pa.

## EDUCATION FOR THE PRACTICE OF VETERINARY MEDICINE\*

By D. H. UDALL, *Ithaca, N. Y.*

*New York State Veterinary College at Cornell University*

Recent literature on education in medical sciences impresses one with the amount of study that has been given to the subject within the last ten or fifteen years. There are many suggestions for better teaching, more effective use of knowledge, and improved methods of practice, all of which concern us.

The success of a system of medical education, or of medical practice, is measured by the effect upon the patient. Is he less subject to disease under the new order? In retrospect, few would care to set back their disease environment even twenty-five years. So far as health is concerned, both for self and for one's animals, we have advanced. The last quarter of the nineteenth century was marked by the discovery of many important laws of health, while the first quarter of the twentieth century has experienced their application. In the use of so much knowledge, confusion was bound to occur. The members of each new branch of learning are apt to measure everything by their newly acquired information, and to look upon the fundamental as outworn because it happens to be old. In the study of a newly-discovered object, the manner of its discovery is easily forgotten.

In planning a system of instruction in the practice of veterinary science, one needs to consider the materials and methods that have been used, as well as those that may prevail in the future. The chief problems of our time may be of slight importance for the generation who are now students. Methods of study and of research that have been highly productive in the recent past may have partially exhausted their possibilities. A disease that holds the attention of scientists of one generation may be in the hands of the sanitary police of the next, or it may be largely historical. Because medicinal herbs once included most of the remedies in the materia medica, and plant poisoning is still a final refuge when diagnosis fails, it does not follow that we should go on trying to imbibe the increasing knowledge of botany. However important or spectacular may be the control of a single

\*Presented at the sixty-fourth annual meeting of the American Veterinary Medical Association, Philadelphia, Pa., September 13-16, 1927.

affection, as tuberculosis, it comprises only a small part of the disease problem of its time. By constantly watching one point, there is danger of losing the perspective. The difficulties that beset the future are best sensed by a broad interest in the present; they cannot be projected from the imagination, or from a narrow experience. Education in medical science needs to change constantly to keep pace with the shifting action of disease, but it does not require a change in its foundation.

#### THE PURPOSE OF THE UNDERGRADUATE CURRICULUM

In discussing this subject, Dr. Charles F. Stockard<sup>1</sup> recently said:

A certain group of articles on medical education usually begin with the statement that the chief object in medical education is to produce capable practitioners of medicine. Such an assertion sweeps far beyond the border of the obvious. No sane person questions the statement or is unaware of the thought conveyed.

That a similar object is the purpose of veterinary education, seems equally apparent. If we accept this view in the preparation of our undergraduate curriculum, students will arrive at commencement with a fair knowledge of their subject; they will have a foundation for their work, be it general practice, specialized practice, public health service, laboratory work, or special research. Failures are often due to lack of this basic training. Some maintain that even an added experience of one or two years in general practice is essential to a successful career in any of the special fields. This advantage is recognized by those corporations that select for special work only men who have succeeded in practice. If this conception is right, our objective is clear; it is to train men how to use their five senses in an understanding on the nature, the distribution, and the control of disease; it is not to cram them with an inexhaustible supply of facts and theories.

#### ATTITUDE TOWARDS PRACTICE AND THE PRACTITIONER

Within a comparatively brief and recent period, new methods of investigation have led to the discovery of cellular pathology, to the relation of bacteria to disease, and to a vast amount of knowledge of the animal body. Many of these discoveries have been made possible by the invention of instruments, and the development of laboratory technic, applied to the 'age-old experimental method. This sudden revelation has apparently led some to feel that the new methods supersede all others in scientific investigation; that the clinical method was all right

for the nineteenth century, but it is not precise enough for the twentieth; that observations on the sick are still useful in the palliative relief of the ailing, but the clinician and his patient are consigned to an inferior position; that while useful knowledge may come from such a source, it will be barren of fundamental truth; that the spirit of science is elsewhere; that research now occupies a higher plane.

Expressions of this view are common. In my student days, I read that the great pathologist, Robert Koch, left the practice of medicine for the higher calling of research. A member of my class in the veterinary school often remarked that he would have nothing to do with practice, for he was interested only in science. Nearly twenty years ago, one of our graduates rode with me for a few days in the ambulatory clinic. One day he remarked, "How can you do any research work and spend so much time in the clinic?" It is not rare to hear, that for a certain purpose the scientific, not the clinical, is desired. From the president of a well-known education board I have received a letter which states, "Fellowships are confined to a strictly limited number of men who are on the *scientific side*, engaged primarily in research." Since the candidate whose application was denied was a clinician, the distinction is obvious. From a member of the American Veterinary Medical Association who ranks high as a research worker, I have this illuminating phrase: "The semi-scientific presentations such as practitioners appreciate and readily grasp." On this conception, one finds numerous comments. Those that follow are selected at random.

Dr. Wm. J. Mayo<sup>2</sup> says:

Today one may say truthfully that medical researches designed to relieve generations yet unborn are looked upon as being almost holy in conception, whereas the relief of people who are miserable and suffering is too often looked on as sordid and commercial.

Dr. Arthur Dean Bevan<sup>3</sup> states:

It seems difficult for some minds to comprehend the fact that a clinical teacher can spend his life in the wards and private rooms and laboratories of a hospital . . . and yet devote his life to clinical teaching and research just as completely as does the physiologist in his class room and his laboratory.

Quoting Dr. James B. Herrick<sup>4</sup>:

Clinical medicine—using medicine in its broader sense as including medicine, surgery, obstetrics, and the specialties—should also be presented to out students by one who is himself a clinician, a practicing doctor. Such a teacher should be well informed as to facts, well trained as to methods. He must be an expert in the application of his knowledge in diagnosis and treatment. He is intellectually as scientific as his laboratory or all-time colleagues. Dr. Flexner's analysis of this point in the early pages of his recent book on medical education is illuminating, and is

comforting to physicians who have felt long the injustice of the too prevalent attitude of supercilious superiority assumed by some laboratory workers. To immerse oneself in a hospital or laboratory does not of necessity make a man a scientist. Nor does a man who engages in practice by so doing necessarily lose his scientific habits of thought.

Sir James MacKenzie<sup>6</sup> says:

Until recent years, the teachers of medicine, and those who have done so much to advance our knowledge, have been, to all intents, general practitioners, such as Harvey, Hunter, Jenner, and many others. With the development of laboratory methods, and the influence they have had on medicine, the notion has risen that progress can only be made by their use. Therefore, all facilities have been given to those who could use these methods; indeed so little was it realized that the general practitioner only had opportunities for exploring fields essential to the progress of medicine, that his education was never directed towards equipping for such work, while it was impressed on him, that for research, special methods and facilities were necessary from which he was excluded.

Dr. Abraham Flexner<sup>6</sup> writes:

Science resides in the intellect, not in the instrument. To call a careful and correct bedside observation clinical and a laboratory examination scientific, as if there were some qualitative distinction between the two, is absurd. . . . The clinic is scientific, not merely insofar as it utilizes chemical or physical methods and technic, but primarily because it represents a determined, fearless, and painstaking effort to observe, to explore, to interpret, to unravel. It is not saved to science by laboratory methods; it includes them as simply additional weapons with which to do better what scientific clinicians have always done, viz., observe, explore, unravel

There is a wide spread impression that the scientific quality of medical education and medical practice is in some fashion dependent upon the part played by the laboratory. This is not the case. Science is essentially a matter of observation, inference, generalization. The mind of Sydenham, interested in a sick child and humanely preoccupied with its care, did not, insofar as it functioned scientifically, operate differently from that of Galileo, interested in cosmic physics.

Not only is the part played by the active senses the essential criterion of science; one may go further—the vast and complicated paraphernalia of science are merely means of extending their scope.

That clinical observations have introduced new eras in medical progress is well illustrated in the following quotation from a Harvey Lecture by Dr. Faber,<sup>7</sup> of the University of Copenhagen:

In France at this juncture there were more especially two men who endeavored to plan out the lines of modern therapy. Their significance lies primarily in the fact that they discussed the method to be adopted in order to promote therapeutic progress. These men were Louis, the founder of medical statistics, and Magendie, the creator of modern experimental physiology.

Louis was a clinician and with Laennec and Anfray was one of the pioneers of the scientific school which at the beginning of the nineteenth century founded our present nosography. . . . His therapeutic efforts must be noted in connection with his task to establish definite entities of disease, actual diseases instead of the predominant symptomatological chaos in which the description of disease then found itself.

In 1728 and following years Louis then endeavored to investigate more closely the effect of bleeding by calculating in about 150 cases how the course of the disease progressed in cases where the bleeding was carried out at the initial stages of the disease, that is during the first few days, and cases where it was not undertaken until late in its course. . . . He discovered that the bleeding had no effect whatever on the course.

The tremendous sensation it caused elicited a violent stir in the whole of the medical world. . . . At every bleeding in acute cases, for instance pneumonia, a buffy coat on the blood was observed to form, a proof positive that a harmful substance was being removed.

The occurrence of a buffy coat is merely an essential sequence of the morbid state, not its cause, but if we observe the part it has played in the history of medicine, *we get an idea of the enormous significance general pathology has had and still has in respect to the practical art of healing.*

Since the time when Louis brought science to the clinic, it has been the final testing-ground of all cures. Long before bacteriology was established, clinicians knew that many diseases were infectious, and some of them they controlled. Clinical studies have given us the descriptions and the distribution of disease; they have revealed the results of nature's method of overcoming it, and have led to preventions and cures, as for variola in man, and milk fever in cows.

From the foregoing quotations it is apparent that leaders in medicine vigorously oppose the suggestion that practice is barren of either science or discovery.

#### THE CURRICULUM

I have discussed at some length the purpose of the curriculum, and certain conceptions of medical education as expressed by leading authorities. Conceptions are of more importance than the curriculum, for they determine the organization of the school, the relative support of the various departments, the attitude of the teacher, and the aspirations of the students.

Because of the years of study and experience that the medical curriculum represents, it is included here for comparison with our own, without reference to direct application to veterinary medicine, but to show the relative amount of time given to each group of subjects, and the kind of teaching material employed. For the technic and methods followed in control of diseases of animals are the same as those used by physicians, and a system of teaching that has proved to be satisfactory for one will probably be a success with the other. I have followed the general custom in the use of the terms preclinical, clinical, and educational. The Cornell Medical and Veterinary schools are chosen for comparison. It is probable that any other two representative institutions would give similar results.

The following medical curriculum is also reported from the Proceedings of the Thirty-sixth Annual Meeting of the Association of American Medical Colleges:

SEC. 5—CURRICULUM. The entire course of four years shall consist of from 3,600 to 4,400 hours, distributed as from 900 to 1,000 hours per



TABLE IIB—Curricula of the Cornell Medical College, and the New York State Veterinary College, Cornell University (continued)

	LECTURES AND RECITATIONS	CLINICS	LABORATORY
C Clinical Subjects, Veterinary			
Medicine.....	192	40	
Surgery.....	128	192	48
Obstetrics.....	64	40	
Small Animals.....	32	96	
Poultry.....	32		
Autopsies.....		24	
Jurisprudence.....	16		
Horseshoeing.....			80
Veterinary Hygiene.....	16		
Ophthalmology.....	16		
Totals.....	496	392	128
Grand Total....1016			

year, and shall be grouped as set forth in the following schedule, each group shall be allotted approximately the percentage of hours of the whole number of hours in the course as stated.

1. Anatomy, including Embryology and Histology.....	14	—18½%
2. Physiology.....	4½	— 6 %
3. Biochemistry.....	3½	— 4½%
4. Pathology, Bacteriology and Immunology.....	10	—13 %
5. Pharmacology.....	4	— 5 %
6. Hygiene and Sanitation.....	3	— 4 %
7. General Medicine.....	20	—26½%
Neurology and Psychiatry		
Pediatrics		
Dermatology and Syphilis		
8. General Surgery.....	13½	—17½%
Orthopedic Surgery		
Urology		
Ophthalmology		
Otolaryngology		
Roentgenology		
9. Obstetrics and Gynecology.....	4	— 5 %
Total.....	76	—100%
Electives.....	24	— 0%

When the teaching conditions demand it, a subject may be transferred from one division to another.

Candidates for admission to the medical profession must have a bachelor's degree, while candidates for admission to the veterinary profession must be high school graduates. The University requires of a medical student the liberal culture and general education implied by a college degree in Arts or Sciences.

Let us first compare the educational and preclinical subjects, where the veterinary curriculum has an advantage of about 787 hours. On a semester schedule of fifteen hours a week, this is

the equivalent of almost two years. If the hours devoted by the veterinary student to preclinical subjects could be limited to those of a medical student, either his general education or his clinical training might be considerably advanced. The difference suggests several explanations.

First, since the medical student is required to take chemistry and other science in his bachelor's course, one might suppose that it would give him certain premedical credits that *must* be earned by the veterinary student after he enters the veterinary school. In the catalogue of the Cornell Medical College the following entrance requirements are specified: physics, 8 semester hours; English, 6 semester hours; modern language, 6 semester hours; chemistry, 12 semester hours; biology, 6 semester hours. Of the first three, none is included in the veterinary curriculum. In chemistry, the veterinary curriculum contains fewer hours than the medical curriculum. In biology, the bachelor's course includes six hours, with a statement that embryology and histology are desirable, and that courses in comparative anatomy of vertebrates and elementary histological technique are recommended. This six hours of biology may be considered a duplication of the zoology in the veterinary curriculum. The extra 787 preclinical and educational hours in the veterinary curriculum are not devoted, then, to the study of specified subjects required of the medical student in his bachelor's course. The only subject common to both courses, in which the medical student must spend much more time, is chemistry. The veterinary curriculum may be credited with 288 hours in the educational group, 128 hours of animal husbandry that may be placed in either group, and 371 excess hours of preclinical time as compared with medicine, a total of 787.

A second explanation is that the work for the bachelor's degree gives the medical student a higher average capacity, thus making it possible for him to progress more rapidly. Doubtless this explanation is true, but it does not explain why he requires twice as much time to cover the clinical subjects. If the four years of high school work now accepted for entrance to the veterinary college are insufficient, it is probable that additional education should be obtained before, rather than after, entrance to the veterinary college. Yet we have examples, as in Engineering and Architecture, where English and other similar subjects are taught during the professional course. To require of the veterinary student one or more years of collegiate work

would lead to a marked increase in the quality of the graduates of the veterinary colleges. If the entrance requirements were increased, would the time devoted to preclinical subjects be reduced?

A third explanation is found in the variety of animals encountered by the veterinary student, who must learn the anatomy and physiology of the horse, cow, sheep, swine, dog, and fowl. This reasoning is somewhat specious and, like the preceding paragraph, it does not explain why the medical student requires twice as much time to cover the clinical subjects. It is probable that the variations between the species are more abundant in disease than in health.

A fourth explanation is found in the theory that the requirements of the veterinarian are fundamentally different than those of the physician and that an entirely different relationship exists between the so-called laboratory subjects and the clinical subjects. If this view is accepted, the object of the undergraduate curriculum, "to train men to be practitioners," needs revision.

A fifth explanation rests on circumstances. In the founding of state schools funds have been limited, and it has been less expensive to make adequate provision for such subjects as anatomy, chemistry, physiology, etc. Thus this side of the growth has been relatively easy, and the veterinary school has developed around the laboratory. There follows the possibility that in some instances the needs of the clinical subjects have been judged by the light of laboratory experience alone. In the change from the old private school, where chief emphasis was placed on the patient without due regard for education or training in basic sciences, it is possible that the pendulum has swung too far in the other direction and that too little emphasis is placed on the clinical aspects of disease.

A marked difference is also found in the schedules. In the medical school the student completes his premedical work at the end of the second year, leaving two years free for clinical studies. In the veterinary college the clinical studies begin with the third semester, and they are then interspersed with preclinical studies until the last day of the course.

The difference in time devoted to clinical subjects by the veterinary and medical schools may be variously explained. Medical education represents years of development; it has outgrown the influence of circumstances and approximates what is

regarded as desirable. Its different departments are balanced. The necessity for clinical material, and facilities for its use in teaching, study, and research are recognized. The clinic is the goal to which all other courses lead; it determines the location, for medical schools must build where the sick are to be found; its size and its appointments determine the opportunities of the other departments, as well as the reputation of the institution.

Clinical departments in the veterinary school are conceived and planned in an entirely different mold. To make a clinic pay is a major virtue, and to utilize it for research is a strange notion. The following quotation from Flexner<sup>7</sup> hardly applies to the veterinary clinic:

With the growing, even though still limited, acceptance of the notion that it is the function of the university clinic not only to treat patients and to train students, but to investigate disease, the clinical laboratory of the past decade has proved inadequate. It has, of course, not lost its place or importance—for it is still needed for diagnosis and for the training of students in methods. But as matters now stand, neither independent, nor coordinated departments of pathology, bacteriology, and biochemistry can take the place of research laboratories in the clinic equipped for the study of problems found in the clinic.

The "clinical laboratory of the past decade" is a future hope in veterinary education, and to a large extent this is true of "coordinated departments of pathology, bacteriology, and biochemistry."

In this country liberal appropriations have been made for the control of animal diseases, and for research in veterinary medicine. With the exception of the clinical departments our better schools compare favorably with medical colleges. Is it not fair to assume that our own conceptions are in part responsible for the difference, and for the common effort to teach the application of veterinary science to the animal-owner?

Without further discussion of this complex question, I will close with one more quotation from Flexner:

On the ground of the increasingly successful effort to expel superstition, speculation, and uncritical empiricism from medicine, and to base both knowledge and practice on observation, experiment, and induction, the present volume discusses the science of medicine. In using the term in this guarded sense no distinction can be made between research and practice. The investigator, obviously, observes, experiments and judges; so do the physician and surgeon who practice their art in the modern spirit. To the foregoing discussion, objection might be made on the ground that, after all, the question is one of definition without practical importance. Without doubt, it is a question of definition, whether medicine be or be not classified as a science. But definition in this instance is far from being devoid of practical significance. If medicine is classified as an art, in contra-distinction to a science, the practitioner is instructed to proceed with a clear conscience on superficial or empirical lines; if, on the other hand, he is acutely conscious of a responsibility to scientific spirit and scientific method, he will almost inevitably endeavor

to clarify his conceptions and to proceed more systematically in the accumulation of data, and the framing of hypotheses, and the checking up of results.

In this brief discussion I have attempted to compare conceptions and methods of veterinary education with those of human medicine. Three distinct differences are found: (1) the educational requirements of the medical school are much higher than those of the veterinary college; (2) the preclinical curriculum in the veterinary college is more extensive than that of the medical school; (3) the clinical curriculum in the veterinary college is much less extensive than that of the medical school.

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#### DISCUSSION

DR. W. A. HAGAN: I think it is very unfortunate that the distinction between the so-called laboratory worker and the clinician was ever made. We all know that there is more or less bad blood between some laboratory workers and some clinicians; that some look upon the other group with more or less contempt, and vice versa. Dr. Udall quoted some individual who had made a somewhat contemptuous statement regarding the practitioner. I do not think this statement can be regarded as representative of the opinion of the laboratory workers in general. At the same time, I could cite him statements—and I do not think it would be necessary to cite many—where clinicians or practitioners have a tendency to look with some scorn on the laboratory worker.

I happened to be in Dr. Udall's office some days ago when he was working on this paper, and I discussed some of these things with him. I do not think the comparison he gives of the curricula of the Medical and Veterinary schools of Cornell University is quite fair. We know that a few years ago the curricula were very much shorter than they are at the present time. The problem is coming up, and is increasing each year, as to how one is going to give, in the time he has available, even a basic knowledge of the science of veterinary medicine. I think many teachers try to incorporate too many of the details and not enough of the discipline of thought. We can not give all the details in the time given, but there are certain basic things which are constantly coming up, so I submit, the material which must be given to a veterinary student is very much greater today than a few years ago.

Now, in the upper part of his chart down to the point where he uses the word "clinical," the subjects are identical in all medicine, veterinary or human. In the upper group there are infinitely more workers, more capital and more support has been given in the past, and I believe that knowledge of that part of the subject has increased faster in the last decade or so than of the subjects given in the second part. I see no reason then, why the hours in these subjects ought not to be approximately the same in the Medical and Veterinary schools.

Now as to the lower part, the clinical medicine, if you are considering only medicine, surgery and obstetrics in this category, I see no reason why they should not be approximately even, but I may be wrong in this. At the time I was discussing it with Dr. Udall, he included in the 2243 hours in the medical curriculum, which is practically twice the veterinary, such subjects as pediatrics, 200 hours, psychiatry—I do not remember the number of hours—neurology, and several others. These are subjects in which there has been a great deal of progress made in human medicine and, so far as I can see, they have at the present time very little application in veterinary medicine. Now

if he had subtracted these subjects from the medical side—I can not see how they can with fairness be put in there, when comparing it with the veterinary curriculum, since there is practically no information on the veterinary side. I think we would have had the totals more nearly alike.

DR. V. A. MOORE: I think, in making the comparison between medical and veterinary curricula, that we have got to take into account that one factor which Dr. Udall brought out very clearly here, and that is the difference of the preparation of the men to begin with. In human medicine, especially in the school where the comparison is made, when the man begins to study medicine, he is a graduate. He has had his chemistry as a prerequisite study, that is, the ordinary chemistry. What he gets in the Medical School is more applied physiological chemistry. He has had a great deal of the other basic sciences. In other words, he is better prepared to take care of these studies than the veterinary student coming from a high school. I do not know just how we are going to allocate those different qualities, but I think that eventually the time will come when men will get good education and then study either veterinary or human medicine. The study of cultural subjects, as it exists in many of our curricula, does not seem to work out very satisfactorily. Men who come to work in bacteriology and pathology, that have a direct aim toward acquiring knowledge on which the clinical education is founded, are bound to be well prepared on those subjects. I say that because all our great technicians were men who were experienced in laboratory work, and they got that fundamental knowledge by which they were able to interpret clinical subjects. As they pointed out at one time, when we know our pathology, we will be able to translate the changes that take place from the symptoms; but until we know more about it, we can not do it.

Now I feel that Dr. Udall is very right in feeling that there is just as much scientific work, just as much research work, in the clinic as there is in the laboratory; but, in order to have clinical work scientific, it must be based on fundamental facts and these are facts regarding the conditions with which you are dealing. Now it is not scientific not to try in any way to find out the cause of the cure, etc., but the scientific clinician would find out whether it was due to any parasite or fungus before he understood the other. It is largely an attitude of mind, and the background of knowledge by which you go at this work. Uncorrelated observations do not amount to much. We have had those for all these centuries, and progress is being made and scientific work is being introduced into clinical medicine just as fast as we can get these great discoveries in physiological chemistry, bacteriology, pathology, etc. The clinic must be faced, otherwise you can not interpret the symptoms. It gets back to the same thing that practitioners have felt in regard to laymen testing their cattle with tuberculin. Anybody can inject it, but you have got to have some knowledge of this subject in order to interpret the results, and the error comes in the interpretation. Consequently the background of technical knowledge is necessary, and I think that the great problem that is before us, before men who are interested in building up better veterinary education, is how to get this background of knowledge, separate it out and get that fixed, before we take up the real professional subject.

Now it is not a problem only in veterinary education. The engineers are doing the same thing. They are building a curriculum in some places of culture and engineering. Some say it works and some say it does not. Our experience is that they do not blend well with technical work, and so, in order to get this background for the clinical work, it seems to me we must get the basic subjects, and I feel we ought to get them before we get into the professional work.

DR. R. R. BIRCH: I never have been one to draw very close distinction between clinical and laboratory methods. All are aiming at the same thing and, while we may make a rather rough distinction, after all, we can separate those two things only artificially. I never heard that more forcibly brought out than it was in a remark which I heard Dr. Marek, of Budapest, make. Before I reached Budapest, I had heard considerable praise of his ability as a clinician and diagnostician, and when I arrived I talked with men in the pathological department first. They and others had nothing but praise, concern-

ing Professor Marek's diagnoses. He sometimes failed to make a diagnosis in his work, but when he made one, it usually was correct. When I met Professor Marek, I congratulated him on the proficiency which he had attained, and he replied: "That may be true now, but it is true because I have had the laboratory as my teacher for a great many years." That, I think, sums up the whole thing. Laboratory and clinical methods together, and when we begin to pull them apart, each field suffers.

**DR. H. E. BEMIS:** I hesitate to discuss this paper because I heard only a very little of it. I imagine that one of the points which Dr. Udall was making was the necessity of having the use of laboratory facilities and methods, to facilitate the making of proper diagnoses on clinical cases.

Now there is no question in my mind—I do not think there should be anywhere—but that we must have thorough training in the fundamental subjects. When we get to the clinical work, we need those same subjects on which to base our work. As I see it, the problem of the clinician and a clinical staff, which is usually undermanned, is how to do the work which must be done and still be able to get the laboratory work done. In order to do that, as most clinics are organized, the clinician asks the bacteriologist or physiologist to make certain examinations for him; and that is the way we have been doing, and it has been a great help to the clinic; but the trouble is, when the dean asks the pathologist or the bacteriologist to take up a special problem, he says; "I haven't time for that, I am covered up, doing work for the clinical staff." Of course, that is all well and good, that is probably true, and it seems to me the only question is, what kind of an arrangement should we have in order to have the fundamental work well taught, have what research work is necessary carried on, and still have the same kind of work available for the clinical staff. I do not believe you can tie up in any one man a complete knowledge of all subjects. It can not be done in a clinic. He can not handle the cases which he must handle from day to day, and still be an authority on laboratory technic, but I can well see how Professor Marek has learned—he has always had the backing of the laboratory diagnoses—to make his diagnoses from a clinical standpoint in the clinic and get them very nearly right. After you have seen a few hundred tumors, for instance, and have made your own clinical diagnoses and have sent them to the laboratory and find your diagnoses checked there, after a while you get so you can recognize a certain kind of tumor from its clinical aspect. The same thing is true of other kinds of work.

Now it seems to me we should have our fundamental subjects going on as they are and extended in their own way from their own advantage, but in some way have that same arrangement available for the individual use of the clinical staff. Whether those men should be placed directly in the clinical staff and what the internal arrangement should be, I do not know, but I know what I would like to have. I would like to have a whole staff of my own.

**DR. W. L. WILLIAMS:** It has been my experience, as a clinical teacher, that it is impossible to make use of the volume of clinical material which is presented, and that the members of the staff of the Pathology and Bacteriology departments have always been too interested in their own affairs, so that it has always been with reluctance that I have piled any work upon them. They always have their hands full, and while they have always been very courteous to me in anything which I have requested, I have not presented nearly the material to them that I would have done, had I not known that they were thoroughly engrossed with their own affairs; and it seems to me that, as Professor Udall has intimated, one of the greatest defects in veterinary education is the want of laboratory facilities which are directly and wholly available to the clinics. That is not saying anything against the laboratories of pathology and bacteriology, whatever, but I do feel that the clinician should have a more intimate source to which he can go for aid in the matter, and not have to appeal to another department and interfere with the ordinary work which is always upon it. I have always felt that very strongly, and it seems to me that one of the most important things we can possibly consider in connection with veterinary medicine is that the clinical teacher is to have at all times the direct control of a sufficient staff to conduct the laboratory work.

I still keep in touch with the College, and I often regret to see the enormous waste of material, which it is almost beyond power to value. They do not get, I think, a third or a fourth of the value of the cases today. I think that is a difficulty among all the veterinary colleges of America. We are not getting enough scientific study in our clinics, simply or largely because of want of sufficient aid in the laboratory. I would like to say in regard to Dr. Hagan's remarks, concerning pediatrics, that pediatrics is not in veterinary medicine to any material degree, because we have never given to the subject of diseases of young animals that attention which it deserves; and Professor Udall, in some of his work in regard to the handling of calves especially, has done a very notable work, and there is a large amount of research work to be done in that connection. I have taken occasion, in a number of cases, to point out that the future of a young animal is dependent to a large degree upon the character of its health during its nursing and milk-feeding period. We ought to have more knowledge regarding the diseases of young animals, and we should have more knowledge regarding the influence of the diseases of the young animal upon its efficiency when mature. So that, while we have neglected the subject very much to the detriment of the live stock industry, the problem is there, but, with minor exceptions, is not taken up as an important study.

DR. MOORE: I do not think there is any fundamental difference as to the excessive time in one department over the other. Science is the orderly arrangement of facts; if you get the facts, you can proceed in order.

I see there are a number of men here who are interested in college administration. The question is to obtain appropriations to establish this work on a satisfactory basis. I do not think there is doubting of the statement made by Dr. Udall that in clinical work there should be a man who can make laboratory examinations, that is, do the things that take time and which the clinical man can not do because of the lack of time.

This waste of material is bound to be; you can not avoid it, until you have more help. The practical question is, where are you going to get the help, and where are you going to get the money to pay for it? The money for veterinary schools comes from the legislature, and in the legislature you are dealing with farmers, lawyers, and those who know absolutely nothing about this work. The men in the research laboratories are working on their own problems. They are willing to make an examination to see whether the tissue is a tumor or something else. They can do that, but they can not carry on and make the thorough examinations that the clinical man wants, in order to explain or to find the cause of a certain symptom. There is no question at all in my mind of the importance of laboratories associated with clinics. I have been urging for some time laboratory work for clinical men, but the practical difficulty is to get the money to pay them. It is up to somebody—I don't know who—to make it clear to the men who handle the funds and make the appropriations that this kind of work is necessary.

This condition is temporary. There is no question about it. Progress is being made and after a little time, I think, we will have in our veterinary colleges, men who do clinical pathology, working under the clinicians, with the clinical point of view. This is going to come, but, for the moment, there are practical difficulties in getting the money. The present situation is trying but it will be improved in the future.

DR. HAGAN: I want to refer to one thing that Dr. Williams has said. If I said that the subjects of psychiatry and pediatrics and neurology, etc., were not applicable to veterinary medicine, I did not mean to do so. The point that I meant to bring out was that these subjects have not been developed sufficiently in veterinary medicine, so that at the present time there is any justification, so far as I can see, for giving them the comparative time which is given them in medical schools. I was merely pointing them out in an attempt to justify the difference in the total number of hours as given in the chart.

Another matter: It seems to me that the men in the veterinary schools might very well make use of the veterinary students for much of this laboratory work. In some of the European colleges, the students are required to do a great deal of laboratory work of their own. Professor Fröchner, of Berlin,

assigns a student to a case and requires him to do such things as feces examinations, carry out the routine urinalysis and make blood examinations that would seem to be indicated, and bacteriological examinations. They were simply assigned to the subject, and they got out of it whatever they could. Now, if the clinical students were assigned this material, it seems to me, a good deal might be done, even if the finances of the institution would not permit of obtaining a trained man. A trained man obviously is the best kind, and I think no one would deny that.

There is an intimate relationship between these basic subjects and the clinic. Referring to the meaning of the term "clinical," I hold that bacteriology, for instance, is in many of its phases a clinical subject, in the same sense that medicine is. If you are dealing with a living animal, that is clinical, as I take it, whether it is a subject to be discussed in medicine or to be discussed from the bacteriological viewpoint. They are both dealing with a sick animal.

DR. C. A. CARY: I may have some rather eccentric views about modern methods in the teaching of veterinary medicine. After a number of years in practice, and also in college work, I have come to the conclusion that the modern colleges are running too much laboratory work for practitioners. Now I do not think that we are going to make a technician out of an ordinary graduate, in all of the departments and laboratories that are found in the average veterinary college. I think we are making a mistake, and that is one reason why a great many of the practitioners who are graduated at veterinary colleges throughout the country are not properly trained when they come out. Take the medical practitioner. Does he do all his laboratory work? No. What does he do? He sends the material to the laboratory and has it worked out there.

The college attempts to make a diagnostician, to make all his tests, bacteriological and all others. If you expect him to do all that you are mistaken, because he is not going to do it. He does not have time for it. He may do it, after he gets a large practice, so that he can employ a technician.

Now I believe we must get our men back in contact with animals. You know what they are doing in human hospitals. They are making their internes get into contact with the actual patient. How many men can go out today and do an ordinary diagnosis on a living animal, unless he has a lot of stuff with him? He goes back to the laboratory to do it. We must get back to the animal. Our modern graduates lack the contact they must get in no other way than by experience. You may say this is theoretical. Maybe it is, but I say it is practical and if you do not get back to that, you are not going to turn out practical graduates who can go out and compete with the experienced practitioner.

CHAIRMAN PICKENS: This is a most interesting discussion, but time is passing and we must get along with our program. Dr. Udall, will you close the discussion, please?

DR. UDALL: I had no idea that this paper would excite so much discussion. Some of the difference of opinion is perhaps more apparent than real. Literature on medical education presents terms and topics as used by educated men throughout the world. In my paper I have followed the usual custom—educational subjects, premedical, preclinical, laboratory subjects, and clinical subjects. All have a definite meaning in medical literature; and one can hardly discuss the subject without using them. The distinction between a clinical diagnosis and a laboratory diagnosis is not a part of the subject. The extent to which bacteriology and medicine are clinical studies is not a part of the subject. In standard literature on medical education, however, the subject of bacteriology is listed in the preclinical laboratory group, and medicine is listed in the clinical group. They appear to have found a definite place and a definite relationship in our curricula. The physician uses bacteriology, and the bacteriologist uses the clinic. In this paper I have tried to show the number of hours that students in veterinary and medical schools are required to give to the different subjects, including medicine and bacteriology, which is an entirely different topic.

We have been told that in certain European veterinary schools, the clinicians have profited greatly from laboratory facilities. I believe that a care-

ful reading of my paper will reveal a suggestion that laboratory facilities for clinicians in American veterinary schools will be equally profitable. The laboratory that one finds in Professor Marek's department in Budapest, and in Professor Fröhner's department in Berlin, does not, I believe, have a counterpart in any American veterinary college.

There has been no effort in the preparation of this paper to stress remarks inspired by jealousy or contempt of one group against another. But, as it affects education, it is desirable to discuss conceptions.

To attempt to draw exact comparisons between human and animal diseases for the purpose of adjustment of a curriculum is a waste of time. I am not able to recognize any unfairness in printing, side by side, a veterinary and a medical curriculum. It may well be questioned whether there is any important fundamental difference between the diseases of men and animals, or whether one is more difficult to solve than the other. So far as pediatrics is concerned, it is relatively as important in veterinary medicine as in human medicine. The death rate in young animals is certainly higher than in children.

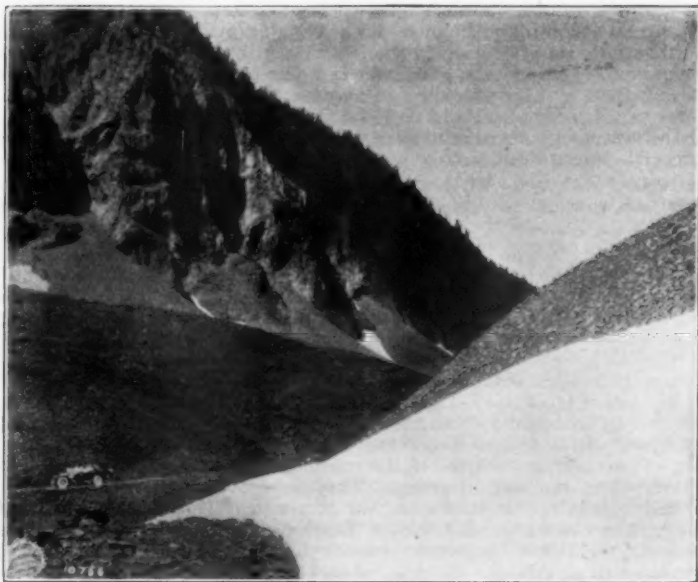
I believe that we should study disease as it occurs naturally in a more thorough manner, and that we should bring to this study all of the facilities that science and research have given us. I am not prepared to say that, with our present facilities and clinics, there should be any marked addition of hours to the clinical group of subjects in the veterinary schools. The fundamental truths of pathology, bacteriology, and physiology are no less abundant in the clinic than elsewhere, but as Flexner has pointed out, they are not revealed to an empiric conception.

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### *Minneapolis, City of Sky Blue Waters*

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#### ON THE WAY TO MINNEAPOLIS



The Cody Road crosses over the Absaroka Mountains at Sylvan Pass, where the snow lies all the year around.

## OBSERVATIONS ON CANINE OBSTETRICS\*

*By J. A. CAMPBELL, Toronto, Canada*

All breeds of dogs are liable to dystokia. There is no variety that will not provide cases of difficult parturition, but the condition is very common among dogs of the short-faced and round-headed varieties, with which features are usually allied thick necks, wide shoulders, and short backs; in other words the dogs whose bulk is at the front end such as English and French bulldogs, Boston terriers, Pekes, toy spaniels and pugs. The different toy breeds, owing to their smallness of physique, contribute many cases of difficult birth.

Among these breeds there is a distinct tendency towards defective hind quarters. We find straight, loosely formed hind legs, dislocations of the patella joint and shallow ossa innominata, all of which seem to be nature's reaction against artificial standards, since they constitute a decided handicap when it comes to delivering puppies. The dog fancier has definitely neglected the hind part in his breeding operations. His concentration on the fore part has resulted in genital features which make a normal birth almost impossible for bitches whose pelvic canal has not made commensurate changes with the anterior part of the body. The system of judging the breeds that are prone to whelping troubles is intensifying and perpetuating these faults, particularly with respect to the shortness of the back which is brought about by applying the same standard for bitches as for dogs. There should be a decided difference between them in this regard. A closely coupled female of the masculine type is not a good breeding proposition, as she lacks the accommodation. Such types are inclined to be too heavily muscled in the hind quarters, which does not allow the necessary yielding of the structures at whelping time.

"Died whelping" was frequently the obituary notice of a famous show bitch that was used as a brood female.

To illustrate how extensively these dogs have increased in numbers recently, I glanced over the catalog of a 1906 dog show at which 650 entries were benched. Of these only sixty-five dogs, or exactly ten per cent, belonged to the short-faced varieties and toy breeds. This number was made up of English and French

\*Presented at the sixty-fourth annual meeting of the American Veterinary Medical Association, Philadelphia, Pa., September 13-16, 1927.

bulls, Bostons, pugs, English toy spaniels, Poms, and Yorkshire terriers. The current catalog for this same show last year includes 245 short-faced and toy breeds out of the 710 dogs benched, an increase from ten to thirty-five per cent.

Take the Boston terrier for example, the most popular breed on this continent today, one of the largest representatives at dog shows and owned literally by thousands of people. This popular American dog whose basic progenitor was the English bull dog, a dog notorious for its short face, massive skull, thick muscular neck, wide chest and heavy shoulders, low front legs, roached back and narrow hind quarters—a build which so far as natural breeding is concerned shows a total lack of balance. The young

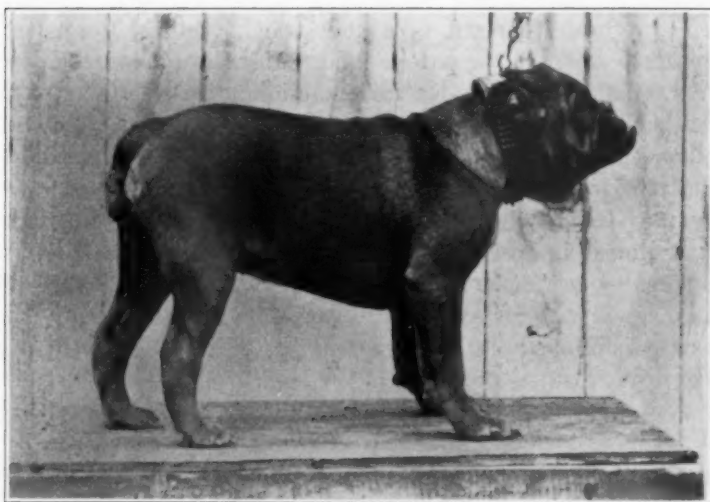


FIG. 1. A good example of a short-backed, masculine English bulldog bitch. A type that wins when showing, but is handicapped when whelping.

of the Boston, conforming to the laws of nature, tend at birth to resemble their bull dog ancestors and to be too heavily built in the fore part in proportion to their mother's genital passage.

Nowadays, the chief contributor to dystokia, apart from the usual text-book cases, such as obstructions of the genital passage in the way of growths and deformities of the pelvis due to disease or injury, is the unnatural conformation of the dam. Dog fanciers show great lack of thought in breeding females that are totally unsuitable, many of which indeed are altogether too small. The desire on the part of the public to possess diminutive specimens of certain varieties influences breeders to mate their small

females; many of which are cretins. We often see the resulting young, even before maturity, about three times the size of their mother. To breed small dogs one must take into consideration the size of the immediate ancestry on both sides for several generations back. Then again, we habitually see a well-bred bitch, that has a good head and front but is crippled behind, used as a brood bitch. Such females invariably have more or less trouble.

Physical condition of the bitch when due to whelp has a considerable bearing on the way she will stand the ordeal. It is safe to say that the majority are too fat or in poor muscular tone. The chief sufferers in this class are the family pets, as well as the lazy bitch which lies around the kennel, and the female which has missed two or three times and then conceives at three or four years of age. With such, there is a decided lack of the vitality and activity which characterize the younger bitch. With this group, which might include any breed, there is a tendency to accumulate even more fat while pregnant. They seem to give up after a few attempts at straining. The same applies to the other extreme; a thin or under-nourished bitch has a hard time, owing to debility and weakness, and tires rapidly.

The ordeal of parturition, particularly with animals with multiple pregnancies, requires them to be in the very best possible condition and muscular fettle, which is obtained only by ample and regular exercise.

Fecal impaction and a distended bladder will obstruct the passage of a fetus.

From a fetal standpoint conformation is also a decided factor at birth. A puppy of the round-headed kind with its noseless, ball-shaped head, thick neck, heavily muscled shoulders, stubby legs and cobby body, is a distinct contrast to the build of, we will say, a collie pup with its sharp pointed nose, long narrow skull, long neck and legs, and slender body. When it comes to entering and traveling through the genital funnel, the latter has every advantage and will pass out with the least amount of resistance. It is easily seen that a pup with the former build will have difficulty in securing an entrance into the pelvic canal; and when it does, the obstacles it possesses in the way of its heavily proportioned body present a further handicap to its outward journey. A variation in the sizes of the fetus occurs frequently in such a newly established breed as the Boston and one large pup among others half its size is sometimes found.

Then, too, you find dystokia resulting from misalliances. When a small bitch is mated by a dog of very much larger breed, the puppies are liable to be out of all proportion to her capacity to deliver them.

When parturition occurs with a single pregnancy, it is quite natural to assume that it will be much larger than the average puppy of a normal litter. With this condition, which is quite common with the Boston or bulldog, there is a lack of sufficient stimuli to bring on normal parturition and the period of pregnancy will invariably run over time, with resulting trouble.



FIG. 2. Fore and aft views of a pair of English bulldogs, which illustrate why dystokia is so common with this breed.

In cases of small, short-backed females carrying a large litter, crowding will result. A puppy at the end of the horn may be lying just in front of the pelvic opening interfering with one about to be delivered.

Abnormalities of the fetus such as hydrocephalus and anasarca may increase its size to such an extent that dystokia will result. The presence of dead puppies in different stages of decomposition and the existence of infection will also inhibit the process of parturition.

Malpresentation is not so common as breeders declare it is, but the head may be turned downwards or deviated to one side with one or both fore legs protruding into the pelvic canal. The fore legs are apt to lie backward and throw the shoulder joint out, which will interfere with the passage of a pup. Transverse positions are sometimes assumed and there may be two pups simultaneously presenting themselves for birth.

Retained placenta of a previous puppy quite often occurs, interfering with the egress of subsequent puppies. Then again, an afterbirth may still adhere and hold a puppy back.

#### PARTURITION

Now a word or two about normal parturition at this point is in order before we take up the methods of dealing with dystokia.

When giving birth, the dog shows considerable variation owing to the many differences between the breeds. The very act of whelping varies considerably. Generally speaking, there is more excitement in young bitches or those that are whelping for their first time. Females that have had several litters may not exhibit much evidence before a puppy is born. Invariably the symptoms are a desire to make a nest or seek some place to be alone, lack of usual interest in food, panting, change of facial expression, more or less discomfiture, vulva enlarged, and the mucous membrane red, giving off a white of an egg-like discharge and the presence of white milk. This state may exist as long as twenty-four hours before a birth takes place.

Some bitches will give birth quickly, at regular intervals; others may take all day with irregular delay between births, this depending on the breed and the number of pregnancies.

The position the female usually assumes when whelping is lying on her side. There may be a few moans or cries of pain while in the act of straining, but, when a bitch repeatedly leaves the nest and places herself in the attitude of urinating, it is invariably a case of dystokia. Some owners are apt to depend too much on the time rather than on the manifestations of the female. The general idea is that a dog's period of pregnancy is 63 days. Novice breeders are apt not to concern themselves at any efforts the bitch may make before that time; attributing such efforts to false labor pains, which occur in the human but seldom in the dog, and when they have come to seek our assistance, they find, often to their sorrow, that they are too late.

The female has been, in reality, doing her utmost to expel a fetus a day or so before.

The best plan is to consider straining on the part of the female as a positive indication that parturition has commenced. Examination of the stud-book records shows us that for one thousand births the average period of pregnancy is between sixty-one and sixty-two days. Some bitches will go from 65 to 67 days and as late as 72.

A very large proportion of the puppies in multiple pregnancies come with their hind legs first. This position occurs so frequently

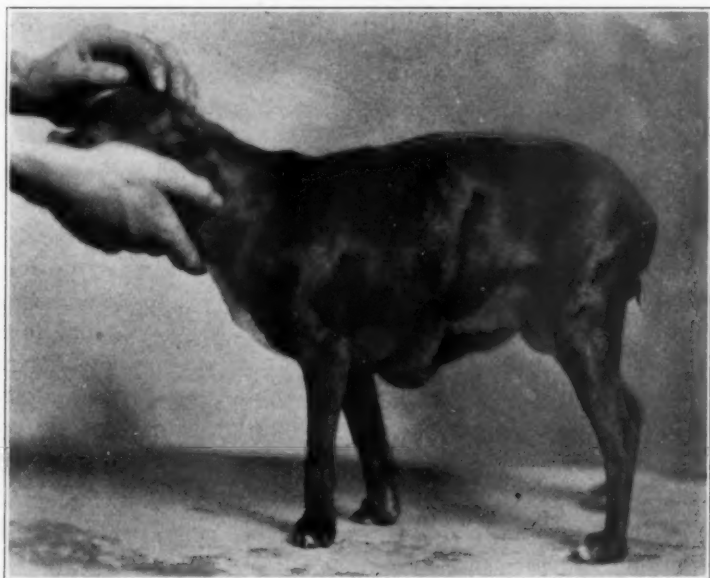


FIG. 3. An undersized Boston terrier, a decided cripple, used as a brood bitch, as she was so well-bred.

—in fact possibly between thirty and forty per cent of the cases—that it must be considered almost a normal case.

It has been said that a fetus will not live long when the membranes have ruptured. I have known several pups to live fifteen hours. This, of course, depends on the amount of straining that has taken place and the nervous temperament of the female, also whether the placenta is still functioning in its place and the amount of fluid present. Puppies delivered, whether naturally or artificially, before the fifty-ninth day, invariably die unless

kept by themselves in very warm surroundings and held on the bitch while nursing, when there is hope of saving them.

With dogs larger than the Boston, there is difficulty in determining whether the uterus is empty. One has to be very careful that no pup remains or not to make too positive a statement to this effect. Some bitches may retain a pup or two, carry them for several days and seem normal, and without ill effects finally deliver them. The continuance of a blackish-green discharge and the slightest sign of straining are very sure symptoms that something remains, either a pup or afterbirth. The owner should always be warned to report the slightest condition of this kind. But, generally speaking, when there is anything left it is quite obvious, as the bitch loses appetite, shows little interest in her pups and rapidly becomes toxic.

#### EXAMINATION OF THE FEMALE

Parturition cases may occur, of course, either at the home or in the hospital. We prefer the hospital, naturally. Every convenience is at hand and the patient can be adequately observed.

When a whelping case is brought in, the female is placed on the table for examination. The owner is asked when the bitch was due, number of services, if she has had pups before and if any difficulty with previous parturition, and if so, whether the same sire has been used, when the first signs of whelping were noticed and the extent of her efforts, when she last fed and whether she has been vomiting. We examine her condition to see if she is toxic, number of puppies she is carrying, the color of the milk, the condition of the vulva, and discharges, and the presence or not of odor, and whether there has been any attempt at delivery.

The bitch is then prepared for an internal examination, which consists of cutting off the hair from the parts, if a long-haired dog; washing and disinfecting. Exploration by the finger is made to ascertain conditions in the vagina and uterus, and the whereabouts and state of the fetus.

We may get a female that is overdue, but seemingly normal, a female that has been showing signs of parturition but without results, a female with the first pup lodged in the vagina, a female which has delivered some pups and then developed dystokia and is in good condition, or a female whose puppies are dead.

After an examination with a view to arriving at the best course to pursue, in a case of whelping, it is necessary to make up

one's mind quickly as to whether the condition of the case calls for immediate action or allows for delay.

The owner has to be considered in a large measure and sometimes requires tactful handling, particularly if he is inexperienced with whelping troubles. Any appearance of haste must be guarded against. At the same time there is danger in delay and it is not advisable to leave too much to nature, who has long since given up her interest in the domestic dog. One man may suddenly appear on the scene and say very abruptly, "Hurry up and open this bitch! I am not going to take any chances, she has been laboring for two hours," while another individual will say, late at night, "I want you just to have a look at this bitch. She has

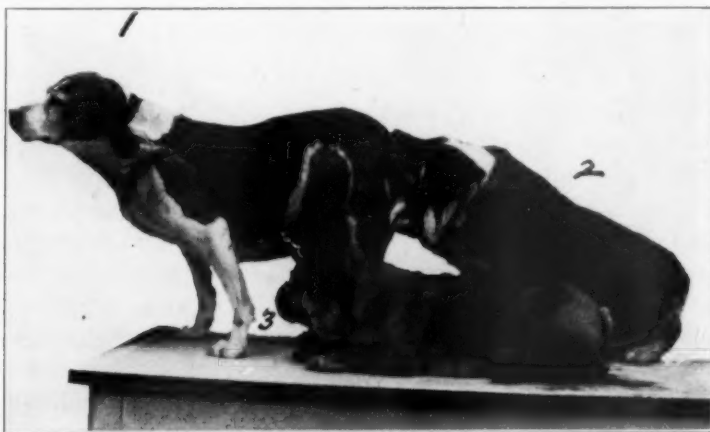


FIG. 4. Three Typical Cesareans. (1) Part Beagle and Foxhound,  $3\frac{1}{2}$  year old, very fat. Confined in a small yard between hunting seasons. Bred by an Airdale. Parturition commenced on the 62nd day. She was soon in great distress. Nine living puppies were removed. (2) Registered English bulldog, 4 years old. One large fetus delivered alive on the 67th day. (3) A cretin English bulldog, 1 year old. Four live puppies.

been straining on and off all day but her time isn't up until the day after tomorrow. We want to give her every chance. She had a litter two years ago without any trouble, yet we don't want her to suffer or to lose her or any of the pups. My neighbor, who breeds Airedales and fox terriers advised me to let nature take its course; said she would have them all right. He often has bitches go overtime." We explain the condition in which we find the female and point out why we are of the opinion that she cannot deliver her young naturally, and the danger of delay, at the same time qualifying our statements that there is always the remote possibility of her being able to pass the pups, but the

risk in waiting would not warrant postponing active measures any longer. Then, if there is the indication that a cesarean operation will have to be performed, we advise him to discuss the situation with some one who has had experience with it. We have known bitches to have a natural birth when there was every indication that it was impossible for them to do so and an unfavorable impression is created in the mind of the owner.

Boston terrier fanciers do not wait very long before they seek assistance. If no puppies are born four to six hours after decided indications of whelping are noticed, or two hours after the last puppy is born, they become anxious, whereas a fox terrier or collie breeder, to whom dystokia is rare, may not seek advice for a day or so after dystokia has set in.

Nowadays, the majority of cases of dystokia that we have are bitches that have been whelping without being able to deliver any puppies at all, and it is becoming more and more the practice to deliver these by performing hysterotomy. Dog breeders who are our best customers, and also the most exacting, want results and do not wish to lose their valuable breeding stock or the puppies, upon which they have built up high hopes. They readily see the cesarean operation is the safe and sane procedure with very little danger of loss.

Breeders have reached a point of looking to us for correct advice and assistance. When anything goes wrong, it is laid at our door and the bad news soon spreads among the fancy.

#### ECBOLICS

Now coming to the different methods of treatment in cases where assistance has been sought, these depend on circumstances. They may be by manipulations, use of medicinal agents or ecbolics, the use of instruments or the cesarean operation.

Medicinal agents have their place in dystokia. They are pituitrin, preparations of ergot of rye, and quinin. Of these, pituitrin is the most reliable and will act promptly and effectively in some cases. We have used ergot of rye and quinin, the former with indifferent results, and none to speak of with the latter. Their use is indicated where the phenomena of parturition have started and the passage is clear for a birth, such as uterine inertia, or in protracted cases. If, on the administration of two doses of pituitrin there is no action noticed, repeated doses do not appear to improve matters and time would not permit depending on their use. Further and definite steps of a positive

nature must be taken at once if unfortunate results are to be avoided. Some years ago pituitrin was acclaimed by non-professional writers in dog journals as a solution of whelping problems. Unfortunately, it is not a complete solution by any means.

#### MANIPULATIONS

Very frequently puppies can be delivered with the hand by introducing a finger into the genital passage and the act of moving

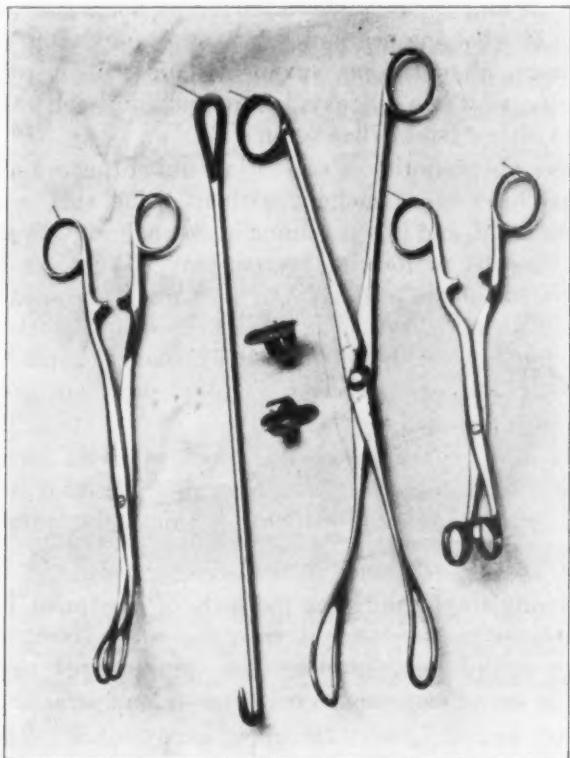


Fig. 5. (Left to right) Forrester's sponge forceps. A very useful instrument for securing a leg. Placenta burr and parturition hook. Finger grips. Corey's forceps. Their slenderness makes delicate handling possible. Ashton's pile clamps. Small, with lots of power for crushing dead fetus

it around will be the means of stimulating the labor pains, and if the fetus can be felt and made to move, straining on the part of the bitch is likely to increase. This in itself is frequently sufficient to start labor, in fact, a drive around the block in an auto or even having the bitch run up and down stairs will start the delayed birth.

By palpating and massaging the abdominal walls it is possible to propel a fetus along the uterine passage and eventually expel it. We frequently have cases where a puppy is held up and becomes stationary with its head or hind legs in the vulva region. Delivery is made by the fingers by gently pulling the protruding parts and gradually working higher and higher, at the same time assisting through the belly walls with the free hand. Where only one hind leg is felt, the other should be secured so as to distribute the strain.

It is a great help to have several pieces of soft cloth at hand while delivering pups. When it becomes necessary to grasp a fetus with the hand, it should be covered with gauze so as to obtain a firmer hold. Most puppies are killed in delivery by dislocation of the first cervical joint. This can be guarded against by securing a hold, with the finger and thumb of the left hand, on the neck posterior to this articulation. In cases where it is a breech presentation the back of the head is liable to become lodged against the roof of the pelvis. When this is found to have occurred the finger tips of both hands must be placed on either side, just in front of the pelvis, so that they feel the head and can press it through the canal. A fatality is likely to occur from suffocation with a breech presentation if there is much delay; whereas, with a head coming first, there is danger of injury where forceps are used.

#### INSTRUMENTS

When should we use instruments? Their use is called for where several pups have been born and dystokia occurs; where dead puppies are present; and where it is decided that it would be more advantageous to save the bitch rather than the progeny.

Before delivery is to be attempted with instruments, the back and hind quarters should be thoroughly washed and disinfected. With a long-haired animal the hair should be cut off closely surrounding the region of the perineum and the tail; and it is advisable, wherever possible, to cover the parts with a sterile cloth. Besides the instruments being placed in a mild antiseptic solution we like to have two dishes of the same solution for rinsing the hands. The bitch should be made to stand, as any other position will have a tendency to crowd the abdominal viscera into the contents of the uterus, except when an anesthetic is being used for this method of delivery.

I have made it a practice to buy every appliance recommended for canine obstetrics and have tried all kinds of hooks, snares, and forceps. Practically the only instruments I now use for delivery are forceps. My favorites for this work are different shaped human placenta forceps which I have collected while rummaging in the instrument supply houses. Corcy forceps are the ones I find most satisfactory when it comes to removing live puppies. They are long enough for the big breeds and can be used safely for the large toys. I have a pair of reduced size for very small bitches. These forceps have the advantage of being strong, though lightly constructed, with thin smooth blades, which have flexibility, a good distribution of pressure and also the advantage of being easily taken apart and joined together inside the uterus after being separately placed on the fetus.

Most of the bitch forceps are heavily made, particularly those with the inside surfaces of the jaws serrated. They are more serviceable in extracting a dead puppy. Forceps which I find very useful for this purpose are the Aston's pile clamps and I meet with more success with them when it is necessary to crush a skull or to remove a fetus piecemeal. Care has to be taken in their use, as the surfaces of the jaws are sharp at the edges.

The great point in working with instruments is to acquire the feel of things inside; to know by their touch whether they are on a part of the uterus or the fetus. It is not advisable to attempt their use until the puppy can be felt with the finger. The possibility of inflicting injury to the bitch should be uppermost in the mind of the operator. There are two safeguards. One is a well lubricated finger and the other is the free use of some mild antiseptic lubricant. For this purpose we have a grease-gun which was originally intended for packing gauze into a cavity. We also inject flaxseed tea which very closely resembles the fetal fluids. These precautions are particularly indicated where the mucosa is dry and swollen. Before exerting pressure with the forceps, the finger should always be made to feel that no part of the instrument has included any of the genital wall.

Where there is a head presentation the end of the finger should be placed under the point of the chin to close the mouth and to guide the head over the brim of the pelvis. If this last precaution is not carried out, the pressure of the forceps will cause the pup to open its mouth and the lower jaw will become jammed against the edge of the pelvis. While instruments are on the head, there is great possibility of the ear being torn off or the eyes

injured, the latter especially in the prominent-eyed breeds. With a breech presentation the forceps should be placed on the fleshy part of the leg, if possible, before any pressure or traction is made, as it is better able to stand injury than the bony structures.

It is always advisable to apply traction in conjunction with the efforts of the female and plenty of time should be taken. A good assistant can give great help by manipulating the fetus through the abdominal walls and working it along the passage.

When it is known a puppy is dead, every effort should be made to crush it as much as possible before attempting to withdraw it, and in cases where it becomes difficult to remove a dead fetus it is advisable to try several forceps of different shapes and sometimes a change of operators will meet with immediate success, as the sense of touch is sometimes lost if the hands tire. Where there is any danger of infection we always thoroughly irrigate the uterus by using therapogen, permanganate of potash or saline solutions, which should be continued if infection is manifested. The use of a general anesthetic in conjunction with forceps often works well. We have seen bitches expel a fetus while ether was being administered for a cesarean operation, prior to which there had been no results from continued straining on the part of the bitch.

In the event of retained afterbirth, it may be removed with a placenta-burr, which, on being passed well into the uterus, is gently rotated to gather up the loose shreds of the membranes until by the feel it is known that the whole mass has been wound around the instrument.

One should always consider the bitch in respect to her suffering or becoming tired, and if the operation is of long duration she should have ample rest. Quite often during these intervals the fetus may change its position and come into a more favorable position for delivery.

#### CESAREAN SECTION

There remains, fortunately, the cesarean operation, not as a last resort, but as a practical and humane modern method of effecting delivery of pups in cases of dystokia which would otherwise result in disaster to mother and offspring. No longer is the cesarean operation something about which you have to conquer the prejudices of the owner before he will permit its use. The good results attending this scientific method of counter-balancing the

results achieved by outraged nature in artificial breeding, as well as the causes, are now so well known among breeders, that owners of dogs, prone to whelping troubles, frequently anticipate us by requesting it. They are willing, in some cases anxious, to have it done so that they may be sure of a safe delivery. Some years ago the cesarean operation was used as a last resort. Now it is a regular and recognized phase of ordinary veterinary practice and a commonplace procedure with breeders of dogs that are prone to whelping difficulties.

The following instruments we have on hand: one surgical knife with a convex cutting surface; one blunt-pointed bistoury; one pair of blunt-pointed scissors; four artery forceps; human tongue forceps for holding uterus; Forester's sponge forceps for securing pups if necessary; needles and suturing material; 00 and 0 catgut for the uterus; Numbers 1, 2 and 3 chromic catgut for muscle walls, and waxed linen thread for the skin.

We place all dogs in a lateral position for anesthesia, with the left side uppermost. In this position the heart action may be observed and worked on in case of an accident. Animals are held by assistants; one for a small dog and two for a medium-sized or larger animal, and on occasions when short-handed, we resort to tying, which is done by applying a soft band over the lower part of the neck and another across the lumbar region just in front of the hind leg. We object to hobbling a patient to the table as it has many disadvantages. With experienced help, who understand the proper method of holding a dog, animals may be securely held, and when the violent struggling ceases, pressure is relaxed. In the event of a collapse, artificial respiration and other means of resuscitation can be quickly instituted.

We make it a practice of administering pituitrin for the following reasons; overcoming shock, contracting the uterus, controlling hemorrhage and stimulating the flow of milk.

We always enter the abdominal cavity, in a cesarean operation, through the left flank; if it is the second occasion, the right side; third, the left side again. We believe this location is far better and has many advantages over the median line. The wound has a better chance of uniting and frequently heals without interruption and if drainage is required, its position is such that it is better taken care of, and may be cleaned while the bitch is lying down. There is very little likelihood of hernia. The part is more out of reach of the puppies which should be placed with the mother as soon as her mental condition allows.

Some objections may be raised that a scar will be more readily seen. This is not so, as in most cases one has to look closely to see whether a bitch has been operated on. In the case of the median line entrance the mammae are very much in the way, and owing to a particularly active and sensitive state at the time, inflammatory processes may extend into them. By this method the position of the wound makes cleaning difficult. It also has greater weight to carry, as abdominal viscera are more likely to come in contact with the region and a hernia may readily occur and the puppies are apt to irritate the opening and annoy the mother.

An area of four inches by six inches for a Boston terrier is shaved and cleaned. While the anesthetic is being administered, the operative area is disinfected with tincture of iodine. When completed, the bitch is carried into the operating-room. The assistants stand ready to hold the patient should she move, and to handle and dry the puppies as they are taken out. Sterile cloths are placed on the bitch leaving the side of the operation exposed to view.

In making the skin incision, on a Boston terrier, the last but one teat is taken as a guide, the bottom of which should be about two inches above the border of the teats and made vertically, varying in length from two to four inches. No particular advantage is to be gained by operating through a small opening as there is always danger of tearing something.

Should a quantity of fat be found beneath the skin, it is removed and the muscular tissue elevated with a hook, and the incision continued through the three layers until the abdominal cavity is entered, with an aperture of about an inch long; and, while the muscles are still elevated, the opening is enlarged with a pair of blunt-pointed scissors. At this point a small artery may be severed and slight hemorrhage encountered, which is controlled with the forceps.

Search is now made for the end of the uppermost horn at its ovarian attachment, which is followed down until a fetus is located. It will depend now on the number present as to how much of the uterus will be exposed. If there are many puppies it will be advisable to go as near the bifurcation as possible so that both horns may be evacuated with the least effort. The use of dry gauze allows a firm grip to be taken on the slippery uterus. To open the womb, a site is selected that is not very vascular or directly over the placenta, and is made in a line with

a long axis of the organ and should be of ample size, as a right-angled tear is apt to result while withdrawing a fetus, if the aperture is too small.

Forester's forceps are applied lightly to the uterus just above the orifice, so that an assistant can hold it in such a position that the fetal fluids will drop clear of the body and not into the abdominal cavity. The pup and placenta are extracted by a steady gentle pull and dropped into the hands of the waiting assistant or some heated receptacle. When it is the latter, the pup is freed of any coverings and the mucus is dislodged from the nose and mouth by shaking the head. Afterbirths may be detached at once or at a later time. Where there is a delay or a large number of puppies to be taken out, necessitating lengthy exposure of the parts, coverings of warm sterile cloths should be used. Difficulties may be encountered where there are no puppies in the upper horn, in which case the lowest part of the non-gravid uterus is entered. It is not quite so easy as if it contained a fetus.

A puppy may be so placed that difficulty is experienced in bringing that part of the uterus out through the opening. Sometimes it is hard to extract a puppy, owing to its slippery state. Help may be had from an assistant by passing the flat of his hand under the belly, as he is able to press the contents up towards the opening. A very useful instrument is the human tongue forceps for grasping a leg, and it is here that the dry cheesecloth is handy.

The womb may exhibit quite a variety of conditions with respect to its contents, as dead puppies in different stages of development and preservation. Some may be in a state of rigor mortis or bloated with emphysema. You may find dropsical or hydrocephalic puppies. If a decomposed or bloated puppy, or a part of the uterus is necrosed, or if there is any odor of infection, prognosis is very unfavorable. It is astonishing how bitches can stand this operation when showing signs of being toxic and apparently unsatisfactory conditions prevail.

We never attempt to flush or irrigate with disinfectants. Any cleaning that is done is confined to mopping with dry sterile swabs. With respect to the presence of necrotic areas these may be excised or hysterectomy performed.

Occasionally a bitch will start to vomit towards the end of the operation, a very frequent happening with a cesarean. Operations should cease until the nausea is over care being taken to close

the opening to prevent abdominal viscera from being forced out, by using firm pressure over the operation opening with sterile cloths. The assistant administering the ether must attend to the bitch, freeing the mouth and throat from mucus and vomit, as there is a possibility of choking or collapse. In a few minutes normal respiration will commence again after the paroxysms of vomiting are over.

#### SUTURING THE UTERUS

When all the puppies, with their placenta, are removed, the uterus is closed and fine catgut of required size used, by means of a continuous suture, commencing at the lower end of the incision, including only the serous and muscle layers. After arriving at the end of the opening and closing it, the suturing should be continued back again to the starting point, making a double row of sewing, one on top of the other, where it is tied up. Care is taken to turn in the cut borders so that the serous coats are brought close together. With removal of any débris, the uterus is returned to its position in the abdominal cavity.

Peritoneum and muscles are sutured together with chromic catgut by the interrupted method, the stitches being about one-quarter to one-half of an inch apart. The skin is united by wax-linen thread, with interrupted sutures one-half inch apart.

Hemorrhage may cause death one to three days after the operation. Removing the afterbirths too hurriedly may be the means of causing this.

The bitch is then placed in a warm cage until the effects of the anesthetic wear off, which may take from a few minutes to several hours. Some have been known to care for and commence nursing puppies intelligently within an hour after entering the hospital.

I am a firm believer in having the bitch in her own home within a few hours after the operation. She settles down much better than if left in the hospital among strange surroundings. We frequently send bitches one hundred miles shortly after the operation.

The day following, a visit is made to remove the bottom stitch for drainage. Instructions are given to see that this is kept open and cleaned several times a day; and to report immediately any change in the disposition of the bitch. If unfavorable symptoms are noticed, such as loss of appetite, the temperature over 103° F., or no interest shown in the young, we advise taking the

puppies off the bitch and placing them on a foster mother, a cat, or resorting to artificial feeding.

We encourage breeders to advise us whenever they have a foster mother available for nursing, of which a register is kept and in some cases a fee is charged. Definite arrangements should always be made beforehand between the owner and the owner of the foster mother in regards to payment for rearing puppies. The fee varies from two dollars to five dollars for rearing a puppy, or it may be advisable to buy the foster mother or hire her for the time being.

Caution has to be used when introducing strange puppies to a foster mother. If she has some of her own they should be mixed together and watched for a while, as the strangers may not be welcome at first. As a general rule, if a female has plenty of milk, she will be only too glad to nurse puppies. A careful examination should be made of the foster bitch, to be sure that she is in good health, particularly with regard to the skin.

Treatment for the bitch is: attention to the wound without tampering with it too much, administration of tonics and forced feeding. In many cases the temperature drops to normal in a few days and the bitch soon gains sufficient progress to nurse her own puppies, providing satisfactory strength is not being made with their nursing by the foster mother or artificial feeding.

#### DISCUSSION

DR. J. C. FLYNN: The paper that Dr. Campbell just read to you contains ideas born of experience. You can always tell when a man knows his subject, because he talks from his finger tips. Dr. Campbell has had twenty years of experience in handling difficult cases of parturition. I have had the pleasure and opportunity of reading this paper very carefully before it was presented to this meeting, and I want to say that I am somewhat discouraged in my efforts to pick out something to criticize. There are a few minor points on which I may possibly differ from Dr. Campbell a little, but, in the main, his paper has covered the subject very completely, and, I think, very satisfactorily.

Dr. Campbell mentions the fact that fecal impaction and a distended bladder interfere with parturition, but he failed to tell us what he did in such cases. We would assume that he would possibly catheterize the matron, although it would be difficult to catheterize the urethra, to relieve the pressure, as any attempt to do so might injure the bladder or rupture it. So much for that point.

Dr. Campbell speaks about making a genital examination, but he did not tell you when to make it. That is one of the last things I do in difficult parturition. I examine the matron by palpating the abdominal walls, to ascertain whether or not there is life there, and try to empty the bladder and bowels. I make my examination of the abdominal walls to ascertain if there is life, whether or not there is labor, and if there is, I would hesitate to make the genital examination, because I believe that any genital examination, in a measure, is injurious to the matron, and I know when you contemplate the necessity of a cesarean operation the less genital examination made the better.

I was glad to hear Dr. Campbell modify his paper and his remarks in regard to the cesarean operation. I will agree with him that it is not a serious

operation, if you can get the matron, and make your diagnosis for this operation in time. But how many times is it that a valuable matron is brought to you in a condition that you know is dangerous, too dangerous to perform the cesarean operation. Yet it is the only thing you can do to give her the last chance, and many times the last chance is the lost chance. Many times it is death to the matron. That has been my experience. I perform that operation when I feel it is almost certain that we are going to lose the matron, and it is the only chance to save her, and where there is life, there is always a chance of saving the animal. I fail to treat the cesarean operation as lightly as does Dr. Campbell but I hope he has been fully successful. I know I have not.

Now, there is another point Dr. Campbell possibly overlooked. It may be that he has never used this other method, and that is, in starting to perform the cesarean operation, when you have opened the abdomen, it is many times possible to remove the fetus without opening the uterus, and when that can be done, I do it. In many cases you can grasp the uterus and push the fetus through without opening the uterus. I believe that is good surgery.

In his paper, Dr. Campbell speaks of clipping the hair from around the genitals and tail. That, from sanitary reasons, is advisable, and it is a good thing to do, but in many cases the owner will not permit it. In those cases I like to use antiseptic gauze and like to bandage the tail. You can do it successfully. You can get away with the hair of the tail by bandaging the entire tail.

Now, another little point that the author brings out in his paper is the separation of the instrument, placing it on the head of the puppy and then putting the instrument together. That sounds awfully good on the platform here, but my experience has been that it is a difficult problem, particularly with the instrument that Dr. Campbell held up before you. If you will hold that instrument up now, and put it together you will find that it is going to spread very wide the part that is in the uterus.

DR. CAMPBELL: I beg to differ with Dr. Flynn. The spreading of the forceps takes place in front of the pelvis, where there is plenty of room, particularly at the upper part of the genital passage. The jaws of the instrument are opened and lowered into their position, on either side of the puppy's head.

DR. FLYNN: In cases when there is lots of room, there would not be any difficulty in parturition.

DR. CAMPBELL: Of course it is difficult to use forceps intact if a puppy is jammed in the pelvic canal. In such situations, I try to push the puppy back into the body of the uterus, and if there is not room to open the jaws, I apply the instrument in two pieces, which I find quite simple. I might point out that in most cases of dystokia, the trouble is lack of room in the vagina. The uterus though is usually roomy enough.

DR. FLYNN: Now then, on one more point I will differ a little with Dr. Campbell. He does not advocate the use of the instrument unless he can feel the pup with his finger. I find that in practice it is necessary to go much higher. You can readily pick up the pup, way up in the uterus, and take it out without the necessity of a cesarean operation, and I believe if it can be done it is better than performing the operation. I have resorted to the method of bringing the uterus out until I could see the horns, and this much more so in the cat than in the dog, because it is more easily done in the cat and safer than the cesarean operation.

DR. CAMPBELL: I quite agree with Dr. Flynn that puppies may be secured by forceps when out of reach of the point of the finger. When one knows one's instruments, one should be able to tell by the feel whether they have grasped the uterus or fetus, but it is nevertheless a good thing to be guided by the finger.

Just a word or two in answer to some of Dr. Flynn's very practical questions. When fecal impaction or distended bladder exists in connection with dystokia, the bowel should be emptied by an enema and the bladder by palpation or massage, and if a fetus is pressing on the floor of the vagina and interfering with micturition, it should be moved.

I see no reason why there should be ill effects from using the fingers in dystokia, if they are long and lean, and kept continually lubricated with a

mild antiseptic ointment. Many belated parturition cases can be brought on by stirring up with the finger, and quite often puppies may be delivered by the fingers. The use of finger grips or a piece of cloth will aid materially in securing a firmer hold on the slimy leg.

DR. FLYNN: I would like to ask Dr. Campbell a question to clear up one little point, and that is: Do you use just the ordinary catgut in stitching up the uterus?

DR. CAMPBELL: Yes. I consider plain catgut is sufficient. The uterus contracts so rapidly that the wound would almost heal without suturing.

DR. FLYNN: I like to use 10-day catgut because I have found that occasionally in abdominal surgery the plain catgut will loosen and slip, and it is a little bit dangerous.

Now, then, one more point, and that is the method and the point of making an incision through both the abdominal wall and the wall of the uterus. Dr. Campbell's method—and I believe it is the method of most surgeons—is to make a clean incision and then cut each of the lower abdominal walls separately. I like to, when I get through the skin, down to the abdominal wall, to the muscle tissues, I mean, insert my finger and separate them by tearing. It leaves a rather rough edge, but you have the advantage of sometimes pushing away fairly good-sized blood-vessels and save some of the nerves that you would destroy by cutting through the tissues.

Now, in regard to the point of incision in the uterus. We always make the incision on the dorsal surface. If there is any leaking, it is less likely to leak through from the dorsal surface than from the ventral surface.

Now in regard to another point—differential diagnosis in pregnancy. We have bitches brought to us occasionally and it is very difficult to diagnose pregnancy in them by the ordinary methods we have at our disposal. We may get a bitch that will come in with an abdomen distended, with milk in the breasts and the vulva enlarged, and most every symptom of pregnancy, and it is sometimes difficult to do that, especially on large fat patients. If I am in doubt on a point of that kind, I like to ask for a little time to make a diagnosis, and I take that animal and keep her for from 24 to 48 hours and I see that the bladder is empty and make my examination, and I can be reasonably accurate on it.

There are other conditions we might speak of, such as septic metritis. It is more likely to confuse the practitioner than any other, in my estimation.

DR. CAMPBELL: With respect to examining a female as to whether there are any puppies present, one should be very thorough, and most guarded in making any statement. Bitches of the breeds larger than the Boston are sometimes quite difficult to examine. I generally tell the owner that I am unable to feel any, but suggest that there is a possibility there may still be one or two left in, and advise him to watch her closely and report immediately if there is any indication of straining or unusual behavior. I might tell him that we could have an X-ray taken, but that this was not always satisfactory.

## UTICA SCORES WELL

The city of Utica, N. Y., received a health score of 820.5 out of a possible perfect total of 1000 points in the city scoring recently carried on throughout the State by Dr. Huntington Williams, of Albany, District State Health Officer. In his report, Dr. Williams gave particularly high credit to Utica for "a generous health budget, for the excellent public health laboratories which are available, for the splendid city milk and meat inspection service under Dr. W. G. Hollingworth and for your good tuberculosis, venereal disease and child hygiene service."

## SOME CAUSES OF STERILITY IN CATTLE\*

By LEONARD W. GOSS, *Columbus, Ohio*

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Causes of sterility in cattle are very numerous. Some of them are easily explained, while others leave considerable doubt in the minds of clinicians and pathologists as to the exact causes. The fact that there is an inter-hormonic relation between the uterus and the ovary and some of the ductless glands, brings about considerable confusion in regard to the seat of the trouble. At times the ovaries show abnormalities which are difficult to explain with regard to the ovary itself. Also the uterus may show little, if any, abnormality which is recognizable. These conditions will be brought forth with some of the illustrations, with little attempt at the present time to state the exact causes. It is the hope of the author that these illustrations will bring forth some constructive discussion.

The persistence of the corpora lutea in the ovaries has received considerable attention by the clinicians in the past. With an attempt to clear up some problems, we will consider the life of the corpus luteum. It is formed after the rupture of the ovarian follicle. This rupture of the follicle takes place about forty-eight hours after estrum, as shown by McNutt.<sup>1</sup> Lutein cells develop within the place occupied by the ovarian follicle. In case of pregnancy, the corpus luteum persists until after parturition, at which time, providing the animal is a normal animal, it undergoes absorption. In the event that the animal is not impregnated, the corpus luteum is greatly reduced in size in about twenty-one days. Small vestiges of a pale color persist for a while. However, the disappearance of the corpus luteum in both events is preceded by fatty degeneration of the luteal cells.

During the two periods, or rather the latter part of each period, the fatty content of the lutein cells increases very rapidly, as shown by Elder<sup>2</sup> and by Bleecker.<sup>3</sup> This change of the luteal cells into fatty material makes it possible for the rapid absorption. The color of the corpus luteum is not an indication of the amount of fat, as shown by Bleecker.<sup>3</sup>

In sexually mature, healthy heifers there is nearly always one well-developed corpus luteum and one or more vestiges which

\*Presented at the sixty-fourth annual meeting of the American Veterinary Medical Association, Philadelphia, Pa., September 13-16, 1927.

are usually quite free of pigment. This condition may not be found in the ovaries of old animals of questionable reproducing

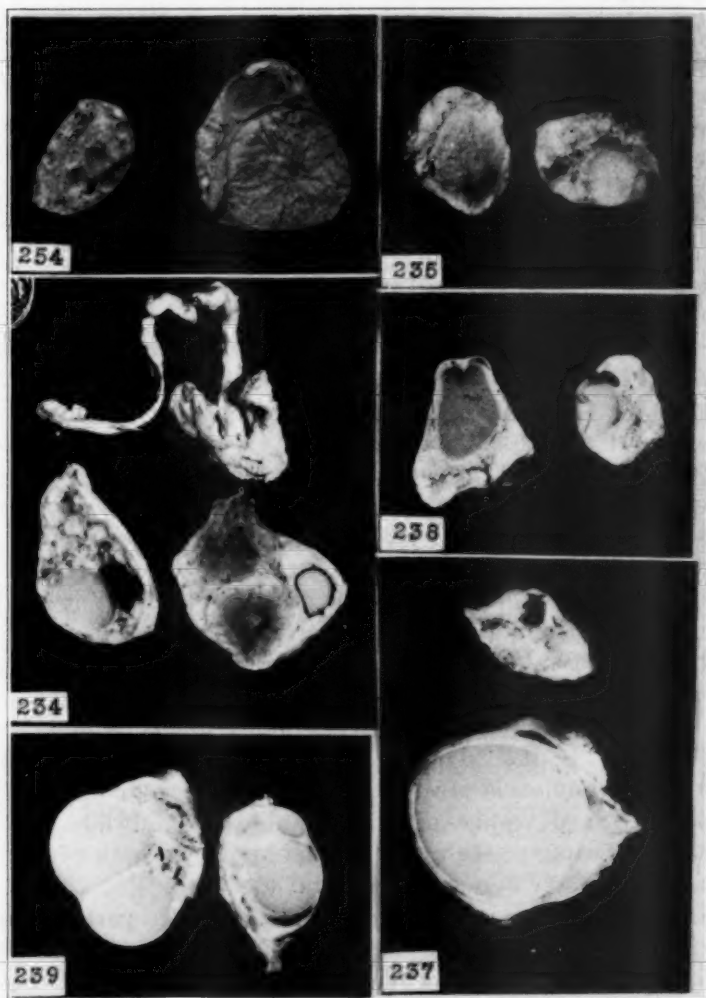


PLATE I.

Specimens 254, 235, 234, 236, 239 and 237.

qualities. Such ovaries may contain several brick-red vestiges of corpora lutea.

No. 254 These are the ovaries from an animal pregnant about 8 weeks; one ovary contains a corpus luteum 24 mm. in diameter, one follicle 7 x 15 mm. The other ovary contains follicles 4 mm. and smaller.

- No. 235 These are the ovaries from a cow with a poor breeding record. There is a corpus luteum in one ovary of the normal size and color. The other ovary contains a follicle 8 mm. in diameter and two vestiges of corpora lutea, brick red in color and irregular in shape, about 3 x 5 mm.

This animal was bred Nov. 29, 1924, Feb. 10, 1925, and March 12, 1925. She was then thought to be with calf. If so, she probably aborted in pasture. Bred, Oct. 10, 1925. In heat, Dec. 10, 1925. Killed, Dec. 24, 1925.

- No. 234 These are the ovaries of an aborting cow. There are two corpora lutea, in one ovary, of the same size, 22 mm. each. Also a cyst, 9 mm. in diameter, which is within brick-red tissue of the vestigial type of corpus luteum. The other ovary contains a follicle, 15 mm. in diameter, and a brick-red corpus luteal vestige, 12 x 7 mm. One of the fallopian tubes was thickened and contained a cyst at one place.

This cow aborted, Aug. 13, 1923, and was thought to have aborted in pasture in June, 1925. Aborted, Nov. 11, 1925. Not in estrum since. Killed, Dec. 24, 1925. It is not known whether she aborted one or two calves.

- No. 238 These are the ovaries of a cow which was sterile. One ovary contains a corpus luteum, somewhat smaller than the average, 14 x 21 mm. The other one contains a follicle and a brick-red vestige, 3 x 6 mm.

This cow aborted, July 26, 1925. Had been bred many times from Nov., 1924, to Nov. 1, 1925. In estrum, Dec. 5, 1925. Killed, Dec. 24, 1925.

- No. 239 These ovaries came from a cow which had a very poor breeding record, as will be seen by the history at hand. She gave birth to a calf, March 30, 1923. Between April 10, 1924, and March 13, 1925, she was bred seven times. She was in pasture during the summer of 1925, with no record of a living or a dead calf.

One ovary contains two cysts, one 27 mm. and the other 20 mm. in diameter. The other ovary contains a cyst with corpora lutea tissue surrounding it, which suggests cystic degeneration of the corpus luteum. This ovary also contains some ovarian follicles.

- No. 237 This pair of ovaries show a large cyst, 38 mm. in diameter, in one ovary and a small crescent-shaped, brick-red vestige of a corpus luteum, 7 x 2 mm. The other ovary contains a vestige, 7 mm., and one smaller. The animal was not pregnant. These ovaries suggest sterility.

- No. 246 This shows the ovaries of an animal which was not pregnant. One ovary contains a vestige of a corpus luteum, 7 mm. in diameter, and two smaller. Also a follicle, 5 mm. in diameter. The other ovary contains a vestige and several follicles, 5 mm. and smaller. The condition of the ovaries is suggestive of sterility.

- No. 253 Pregnant about nine months. Contrast these ovaries with the preceding. One ovary contains a corpus luteum, 26 mm. in diameter. The other ovary contains nine ovarian follicles, about 2 x 4 mm. in diameter.

- No. 252 Of this pair of ovaries, one contains a corpus luteum, bright yellow in color, 24 mm., which contains a cyst, 14 mm. in diameter. Two vestiges, 2 mm. each, of a brick-red color also are present in the same ovary. The other ovary contains a few small follicles, 2 x 4 mm. in diameter.

- No. 251 One ovary contains a corpus luteum, containing a cyst 22 mm. in diameter. The other ovary contains either a follicle or a cyst in the center, 9 mm., and a vestige of a corpus luteum, 3 mm., of a brick-red color.

- No. 250 One ovary contains a corpus luteum, 18 mm., with a cyst 9 mm. in diameter. The cyst was eccentric, having only a thin membrane over the free surface of the corpus luteum. The other ovary contained one follicle or cyst, 20 mm. in diameter.

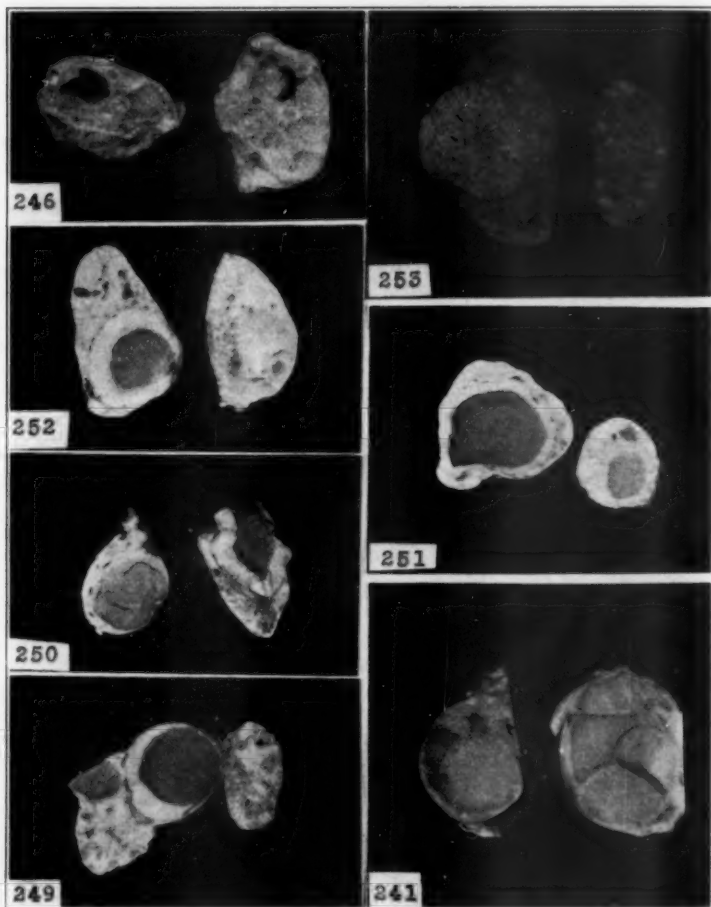


PLATE II.

Specimens 246, 253, 252, 251, 250, 249 and 241.

- No. 249 One ovary contains a corpus luteum, 21 mm., the greater portion of which projects from the body of the ovary. It contains a cyst, 17 mm. in diameter. There is also a follicle, 14 mm., present in the same ovary. The other ovary contains only small follicles.

The foregoing cystic ovaries have contained cysts which have their development as cystic degeneration of the corpora lutea. They are far more common than the other type of cyst. They seem to respond to treatment more readily as they are probably a process associated with persistence of the respective corpus luteum.

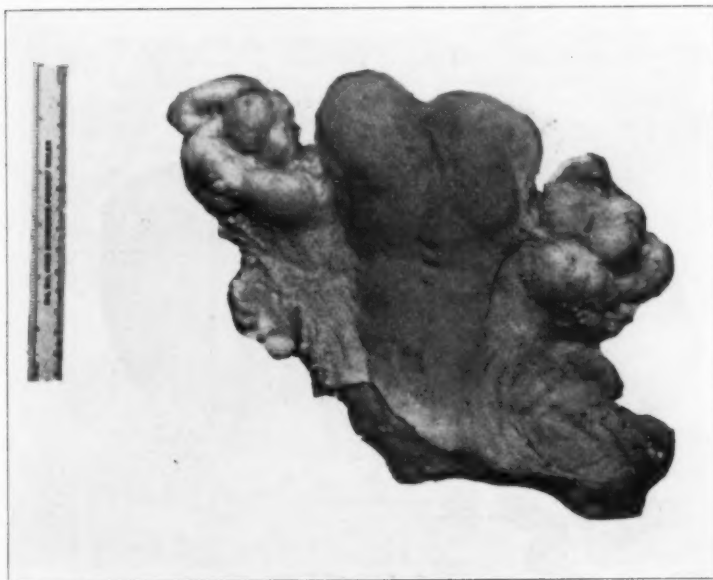


PLATE III  
Specimens 207 (left) and 227 (right).



PLATE IV.  
Specimens 76 (left) and 55 (right).

No. 241 A pair of ovaries which suggest cystic ovarian follicles. One ovary shows the presence of 4 cysts, 20-22 mm. in diameter. They comprise the greater portion of the ovary. The other ovary contains one cyst, 20 mm., and another cyst or follicle, 6 mm. in diameter.

The preceding case (241) shows the presence of cysts which have had their development within the ovarian follicles. This type of cysts is of less frequent occurrence than the preceding, but far more persistent, as it stands in that class of processes with cystic tumors. Consequently, all follicles in such ovaries are prone to undergo cystic degeneration instead of giving off an ovum at regular periods.

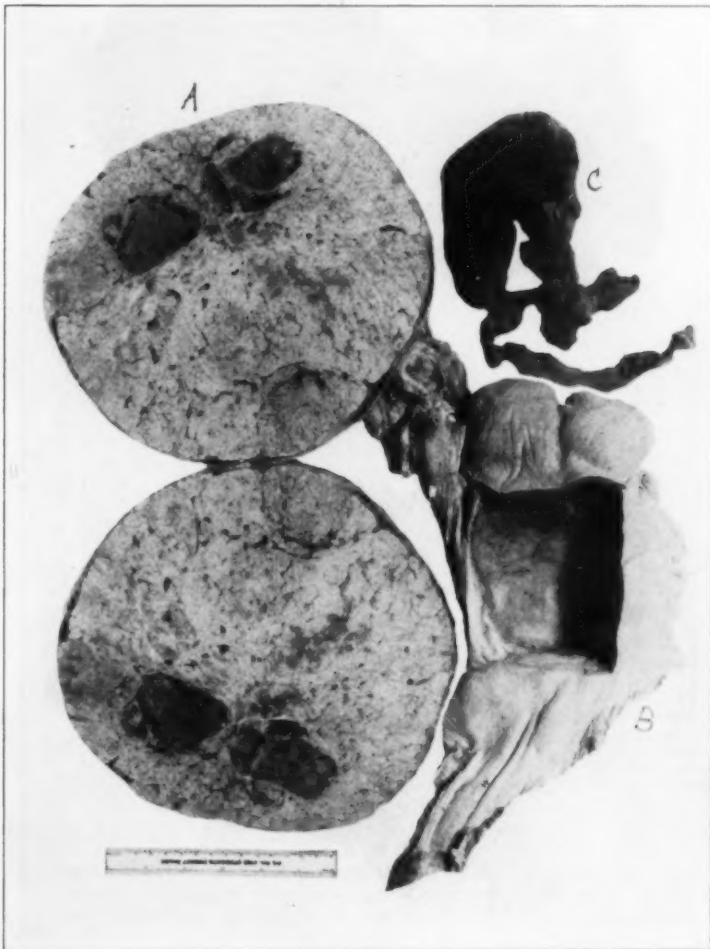


PLATE V.  
Specimen 134.

No. 207 This shows a cystic fallopian tube, 65 mm. in diameter, which prevents the passage of the ovum to the uterus.



PLATE VI.  
Specimens 212 (left) and 28 (right).

- No. 227 Tuberculosis of the fallopian tubes which are increased to about 25 mm. in diameter. One ovary contains a cyst, about 21 mm.; the other contains a cyst, 25 mm. in diameter.



PLATE VII.  
Specimen 124.

- No. 76 Shows the uterus from a cow which had been sterile for a long period. It shows extensive adhesions involving the ovary and fallopian tubes. Probably the results of metritis and perimetritis.

One case of abdominal pregnancy has been encountered. The dead calf, almost mature, was contained within a membrane. It had hair upon it, which was embedded in the membrane surrounding it. This was an umbilicus, about 15 cm. long, the vessels of which became lost within the surrounding membrane.

The uterus was apparently normal. One ovary contained a corpus luteum. This was found in a slaughter-house and no history was obtainable.



PLATE VIII.  
Specimen 136.

- No. 55 Shows a uterus containing the bones of a dead fetus.
- No. 134 Shows a tumor (A) of the ovary, which was about 30 cm. in diameter. The tissue which composed the bulk of the tumor was of the character of the corpus luteum. The uterus (B) contained a mummified fetus (C).
- No. 28 This is a fibroid tumor in one of the horns of the uterus.
- No. 124 This shows the uterus and the vagina of a two-year-old Shorthorn heifer, which came into estrum regularly, but never became impregnated.

Exploration revealed the presence of a large mass in the anterior portion of the vagina.

The animal was slaughtered, at which time it was found that the embryological development of the vagina was incomplete, which left a transverse membrane near its middle. The uterine fluids had accumulated within the vagina forming a cavity six inches in diameter. The uterus contained no fluid and appeared to be in a normal condition.

Lillie's<sup>1</sup> work shows the sterile free-martin is the result of hormones from the male twin circulating through the blood-vessels of the female twin. This is made possible by the anastomosis of the chorionic vessels, which nearly always occurs in the uterus of the cow when twins are present. Lillie reports one case in which there was no anastomosis and that the female was anatomically normal. His observations indicate that about 87 per cent of the free-martins are sterile and 13 per cent fertile.

- No. 212 Shows the organs of a free-martin, in which the ovaries have changed toward testes, in that they contain tubules instead of graafian follicles. There is only a slight development of the wolffian duct and the müllerian duct is well degenerated.
- No. 133 Shows a gland upon one side which contains tubules simulating the structure of testes. The other one is much smaller. The müllerian ducts have enlarged to form tubes about 10 mm. in diameter, but they are only 4-6 cm. long, becoming atrophic before their junction. There is no body to the uterus. The vagina is typical of the free-martin.

The free-martin shows great variation in the extent of the development of the internal genital organs. This is probably due to the hormonal influence of the male twin which may be controlled by the extent and time of the anastomosis or to other unknown factors. The external sex characters are dependent upon the interior anatomical variation toward the male organs.

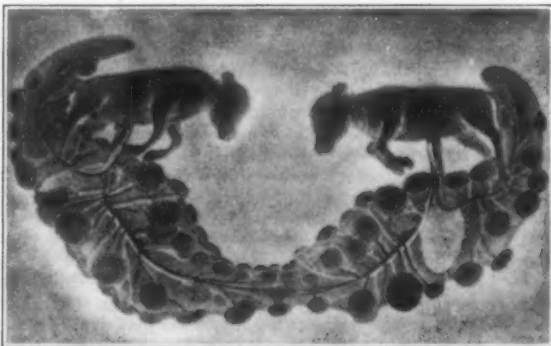


PLATE IX.

Twin calves with fetal membranes, showing the anastomoses of the umbilical vessels. (After Lillie, *Jour. Exp. Zool.*, xxiii (1927), No. 2.)

The persistence of numerous highly colored corpora lutea is suggestive of hormonal influences which are probably located outside of the ovary. In some instances the condition is associated with an unmistakable metritis; at other times, there may be only a catarrhal condition which is not recognized. It is quite probable that there are other contributory factors.

The cystic degeneration of the corpus luteum may be a process of degeneration resulting from long existence of the body, or other factors may be responsible.

The cystic ovarian follicle can probably be classed with the cystic tumor, which usually results in permanent sterility.

Cysts of both fallopian tubes result in sterility through interference with fertilization of the ovum.

The free-martin has a questionable breeding value, as only 13 per cent are fertile. These may be determined at an early age by vaginal examination, as those which are sterile have only the ectodermal invaginated position of a vagina.

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#### DISCUSSION

DR. E. T. HALLMAN: I want to express my appreciation to Dr. Goss for the work that he has just illustrated. At least some of his illustrations demonstrate a problem in pathology about which I know nothing. I refer particularly to ovarian disease. It is a simple matter to demonstrate diseases of the ovary clinically. I refer to cystic corpora lutea or cystic follicles, but I am sure I know nothing about the causes underlying the occurrence of these pathological processes in the ovary.

In Dr. Goss' opening remarks, he referred to the numerous causes of sterility. In order to appreciate the complexity of the causes of sterility, I think it is only necessary for us to appreciate the complexity of the function of reproduction. Reproduction might be defined as a result of the correlated function of a group of organs, including some of the endocrine glands of both sexes. Failure in development of any one of these organs, absence of function or altered function of any one, may prevent conception. We know very little about the function of reproduction. While a little is known, the physiology of reproduction is yet to be worked out. Until we do have a clearer understanding of the physiology of reproduction, we shall not be able to understand altered function of reproduction, which is the basis of sterility.

It is known that the function of at least some of the reproductive organs is cyclic in nature. I refer to the progressive and retrogressive changes in the corpus luteum, the progressive and retrogressive changes of the endometrium, and the progressive and retrogressive changes of the follicle and the placenta. Reproduction apparently depends upon the orderly correlation of these cyclic changes in the various organs. To just what extent the cyclic activity of the various organs is influenced by disturbances in other organs, I do not know. Further, just what influence the disturbance in the cyclic activity of an organ, for instance, the ovary, has on the development of pathological processes in that organ, I do not know. It is entirely possible

that the pathological processes illustrated—persistent corpora lutea and cystic ovaries—may be due to pathological influences in other parts of the reproductive tracts; for instance, due to infection of the cervix and the endometrium. For a long time we have felt that perhaps an important cause of disturbances in the ovary is localized disturbances in the cervix and in the endometrium.

I have made some observations, during the last year, which have tended to stimulate this line of thought which I have just referred to, in connection with some work that I have been doing on the pathology of abortion disease in guinea pigs. It has been my privilege, during the last twelve months, to examine over 2000 slides prepared from the organs of something over 100 guinea pigs, experimentally inoculated with various strains of the abortion bacillus, from both human and animal sources, and one observation that I have made is particularly suggestive, namely, the apparent influence that minute microscopic lesions in the epididymis may have on the condition of the testicle. It is not proper that I should refer here to the pathology of the Bang abortion bacillus more than simply to illustrate what I hope to say. As I have observed the fundamental process of infection in the experiment animals, it is one that partakes of the nature of a focal infection. There is a comparatively mild reaction at the site of the establishment of the organism. There is at first no destruction of tissue, but there is a proliferation of tissue and a determination of cells which, in their essential characteristics, resemble the minute tubercle due to the tubercle bacillus. Time and again we have observed these early areas of focal reaction in the epididymis, microscopic in size, in which there has been no destruction of tissue and in which cases there has been a complete absence of spermatogenesis in the tubular epithelium of the testicle. Time and again I have observed that condition where the examination of many slides from the testicle demonstrated no evidence of localization of infection in the testicle, but the localization of infection apparently limited to the epididymis, and yet for some reason spermatogenesis had ceased and in many cases with very marked degenerative changes in the tubular epithelium.

Further, in some of these same cases we have observed a process which we have interpreted as hyperplasia of the so-called interstitial cell of the testicle. I do not mean by that the interstitial connective tissue, but those large polyhedral cells which many believe are of importance in elaborating the hormone of the male which influences the male sex characteristics.

I am not in a position to interpret or to explain the cause and effect, but I am simply bringing it out here to indicate that it is not illogical to assume that much of the ovarian trouble in cattle is due to disturbances or local infection in the endometrium and in the cervix. Just what they are, I cannot explain. It has at least had one effect on me. In the limited amount of clinical work that I do—as you all know, I am not a clinician, but I do keep my hands in the pie just enough to keep familiar with it—as I think more over the complexity of this problem, I become more and more conservative in my attempts to treat ovarian disease.

One thing of particular importance that Dr. Goss illustrated is the fact that at almost any time during the period of sex activity of the cow, it is possible by clinical examination to demonstrate corpora lutea and one or more developing follicles in one or both ovaries. Of course, we have no difficulty in recognizing the cysts clinically after they have assumed a size which is in excess of the maximum size reached by the mature follicle, but I do know that in clinical work, as practiced by many veterinarians, a great deal of crushing of cysts is done when there are no clinical indications for it. If a cow has a history of sterility, it is a simple matter for the veterinarian to find one or many of these small cyst-like structures in the ovaries. You cannot distinguish, clinically, between a developing follicle and a small cyst, and we know that cysts may be microscopic in size. We all know that corpora lutea are dislodged in cases of clinical sterility, where there are no clinical indications for it. As I have previously said, I have become very conservative in my manipulation of the ovaries. I try to account for lesions in them on the basis of alterations in other parts of the reproductive tract, looking upon them as secondary to some other important factor rather than primary, and in that way I attempt to

direct my efforts towards the primary causes, if possible to recognize them. In other words, I think a great deal of our efforts in the treatment of ovarian trouble has been directed at the result of a condition and not the cause of it.

I am sure that my discussion has not thrown any light on the correction of this problem. I did not hope that it would. It is still a problem of physiological and pathological research. But I do hope that what I have said may stimulate a little more conservation on the part of clinicians in the treatment of the diseases of the reproductive organs and stimulate an effort to acquire all of the knowledge that it is possible to acquire. When you have done that, you will not have acquired a great deal when compared with the vast amount of ignorance that we still have with reference to the physiology of reproduction.

DR. J. F. DE VINE: I do not know that I got what Dr. Goss meant just right. If I did not, others may not. He stated, as I understood him, that Dr. Lillie has found that there is an anastomosis between the circulations in all cases. If he did state that, then he explained later that the influence of the hormones on the female, in the case of male and female, would depend largely upon the amount and time of anastomosis. If that be true, Dr. Goss, what explanation would we have for any of the thirteen per cent being fertile? Perhaps you explained it, but I did not get it.

You also said that the practitioner who treated some of this herd at an earlier period wondered if he had not done some injury by manipulation. If he used the crowbars and picks and shovels that we used twenty years ago, he certainly did, and if he injected irritants in the uterus he certainly did.

Dr. Hallman has just sounded a very sane keynote. Do not maul your animals so that you make a possible breeder an impossible one. I agree with Dr. Hallman that I can not see any excuse in the world why any man, manipulating or handling or examining the female organs and finding them, so far as he can determine, apparently normal, with the possible exception of these little blebs or follicles on the edge, likes to express the corpus luteum. He had been told to do it, and that is the only excuse in the world why he does it, perhaps. But I hope he will stop now, from the good advice that Dr. Hallman has given. Do as little as possible, but make sure that you know what you are doing and, as Dr. Hallman states, perhaps you have just a little catarrhal condition of the cervix that douching will take care of.

This work of clinically handling sterility cases or animals that are giving breeding trouble has been overdone. Get back to sane, careful manipulation and then make sure that you know something about it. One of the most capable practitioners in the East, in this audience, confided to me last night that he did not know whether he had hold of a cyst or a corpus luteum. If he does not know, there are a lot of others of us who do not know. It is unfortunate that Dr. Goss could not have had some actual specimens here. His plates were wonderful to a man who has given the matter any attention, but if we could have had some ovaries and tubes here to show a man what a normal corpus luteum is, or a cystic, degenerative corpus luteum, then he would be able to go out with certainty of knowing one from the other.

I congratulate both the speakers. They are doing the very thing that I think every one should do at this time who is attempting to dispense knowledge on sterility—learn something about the normal organs and then be awfully careful what you do afterwards.

DR. GOSS: Lillie found, in a few cases, that there was no anastomosis of the vessels, and in those cases the female was normal.

DR. DE VINE: Perhaps that accounts for the thirteen per cent.

DR. GOSS: In all of those that were normal females, with a twin male, he has found no anastomosis of the vessels.

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***Minneapolis, the Financial, Wholesaling, Jobbing, Retailing, Manufacturing, Distributing, Educational, Cultural Metropolis of the Northwest***

## THE ILLINOIS OUTBREAK OF DOURINE

By W. L. WILLIAMS, *Ithaca, N. Y.*

The outbreak of dourine in Illinois, officially recognized by the State, in 1887, is of historic interest to the veterinary profession in several ways. It was the first recorded outbreak of the disease in an English-speaking country, so far as I can find. It was probably the focus from which the infection was derived in the later outbreaks in the Northwest.

The official reports of the outbreak appear in the Annual Report of the State Board of Live Stock Commissioners of Illinois, chiefly for the years 1887 and 1888, with minor additions as late as 1894. Like most reports of that class, they have already disappeared and after the lapse of forty years are not readily available to most members of the profession. It therefore appears desirable that the history of the outbreak be briefly retold at this time because, amongst other considerations, references are now and then made to the occurrence in such a manner as apparently to endanger the historical accuracy of the event.

At the time of the outbreak I was performing the dual function of private practitioner at Bloomington, McLean County, Illinois, and Assistant State Veterinarian. By referring to my report of the outbreak in the Annual Report of the Illinois State Board of Live Stock Commissioners for the year ending October 31, 1887, page 62, it will be found that I was called to the adjoining county of DeWitt in April, 1896, in my capacity of a private practitioner, to examine some stallions and mares affected with a disease which I recognized as dourine, then better known as *maladie du coit*. Fortunately Liautard recognized the professional and historical value of the report sufficiently that he copied it entire in the *American Veterinary Review*, Vol. 12, page 295. The existence of the disease was promptly reported by me in 1886, but the Live Stock Commissioners and the State Veterinarian, John Casewell, M. R. C. V. S., were at that time very busy with, and extremely anxious concerning, the great outbreak of contagious pleuro-pneumonia of cattle in Chicago. They had never heard of such a disease as dourine, and so far as any visible reaction to my report was concerned, they apparently did not hear of it then.

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The disease gradually spread and early in 1887 the breeders of the region involved became decidedly alarmed. I then reported the matter to the Commissioners for a second time, advising them that conditions were growing decidedly serious and that, unless the malady were promptly and rigorously dealt with, it promised serious loss to the horse-breeding industry.

Finally the Commissioners authorized me to quarantine any diseased animals but still failed to realize the importance of the situation, to such an extent that I was advised to write out such quarantine notices as I might need instead of the State furnishing printed forms. When I at last convinced the Commissioners that hundreds of animals were involved, and that the disease was very malignant, they met me in the involved region and at once realized the serious state of affairs. I was granted authority to deal with the disease and had placed upon me an abundance of responsibility.

#### A SERIOUS SITUATION

The community was naturally and justly greatly alarmed. There was no one to whom I could turn for counsel who had had experience with dourine. In veterinary literature the two very distinct venereal diseases of horses were hopelessly mixed. I had discovered and reported the disease, and to me had been assigned the task of control. While it was perfectly clear that I was dealing with dourine, veterinary authorities were in hopeless confusion regarding the symptoms and diagnosis. The breeders were much alarmed and were being swayed in various directions, somewhat according to their supposed interests. While technically they knew nothing about the disease, practically they knew quite well that it was killing their horses and that the contagion was spreading. There was no great degree of confidence in veterinarians in general and, quite naturally, none too much confidence in the veterinarian in official charge.

As nearly as the facts could be learned, the disease had been smouldering since the spring of 1883, or three years before I had been consulted. So far as the tangled skein could be unraveled, it appeared that the infection had been introduced from France. It was at that time believed that the offending animal was a Percheron stallion designated in my report as No. XV. This was not proven, but was merely what appeared the most likely source. Looking backward, that conclusion is open to some question. No. XV was alleged to have been imported in 1882,

when two years old. If the allegations as to age and date of importation were true, it is improbable that he had copulated in France, in which case it is virtually certain that he was not infected when imported. But some queer things occurred in those days regarding the ages of imported horses and the represented age did not always correspond with the state of dentition. A small three-year-old was more salable if represented as a large two-year-old.

The French government filed a vigorous protest with that of the United States, against the conclusion that the dourine infection came from France, alleging that the disease was unknown in France at the time. Be that as it may, the disease had been quite certainly introduced from Europe, and there were no imported horses in the involved area, so far as I could learn, except those which were represented as having come from France. By common consent, but so far as I know, in no case accurately traced, all other outbreaks of dourine in North America have been assumed to have originated from the initial outbreak in Illinois.

#### DISEASE UNDER CONTROL IN 1887

Having begun to spread insidiously in 1883 and 1884, the infection had acquired somewhat extensive and intricate dissemination when finally placed under official control in 1887. In the interval, an undetermined number of animals which had been exposed had been sold and had gone to unknown destinations. A few common work mares which had been exposed were traced into adjacent counties and placed in quarantine before they had been bred in their new locations. One stallion, designated as No. XVIII in the 1887 report and said to have been diseased, was traced to California and the authorities notified of his presence. This was the only supposedly diseased stallion known to have left the infected area and the only animal of either sex which was traced to destinations outside of Illinois.

The dangers to other states, counties or localities did not depend upon the diseased or exposed animals which were traced to their destinations but to the undefinable group of animals which had been sold or traded to unknown or unrevealed parties and had disappeared without a trace. It was this group which was apparently responsible for the several outbreaks in the northwestern states and Canada.

It is essential to have a clear conception of the character of dourine, and of the environment of the outbreak, in order to understand how it was possible that the malady did not spread more destructively. Dourine is the most exclusively venereal infection known. Aside from artificial inoculation, its transmission except by coitus is unknown. The environment of the outbreak greatly favored its confinement to a small area. It was restricted, so far as active spread in Illinois was concerned, to an area of 30 to 35 square miles in De Witt County, between Wapella on the north and Clinton on the south. Two or three common work mares which had been exposed or became diseased had been removed to neighboring counties but had not been bred there. The area was not an important exporter of breeding horses. Geldings and some mares were sold to go to distant lumbering-camps and to the eastern cities for work purposes, and none of such mares were likely to be bred. The dangerous sales were of common work mares to go to the northwestern states for the dual purpose of farm work and breeding. These I believe the source of the outbreaks in that region.

#### DISEASE NOT WIDELY DISSEMINATED

The highly concentrated breeding district about Bloomington, Illinois, extended to within less than ten miles of the infected area but there was virtually no traffic in horses between the two sections. Mares were not sent from the one section to the other to be bred. About one thousand draft stallions and mares were imported each year, mostly from France, to the Bloomington area, and sold to go elsewhere. The current was *from* the free, *toward* the infested area. The comparatively few horses sold from the area went out of the State, not into adjacent counties.

After the disease had been placed under official control in June, 1887, so far as I can determine, no infected animal was removed or escaped from the involved area. But one minor outbreak occurred within the infected area. Owing to violation of quarantine, one mare and one grade stallion became affected on one farm, and both animals were promptly destroyed.

I say, "so far as I can determine." In apparent conflict with this is the statement of Kudo<sup>1</sup>:

In 1886, Dr. W. L. Williams, then of Bloomington, Ill., found an outbreak of a disease in horses, which was later found to be dourine, caused by infection with *Trypanosoma equiperdum*. The disease was traced to a Percheron stallion imported from France in 1882. It is most probable that the horse was affected by the trypanosome at the time of purchase.

*Instead of being destroyed, the stallion was shipped to Gordon, Nebr., in 1888, and, in 1892, an outbreak of the disease occurred in northwestern Nebraska.*

The stallion to which Kudo refers was a brown Percheron, commonly known at that time as "the Moore horse," owned by Joseph Fischer, of Clinton, Ill., and designated as No. XV in the 1887 report of the Illinois State Board of Live Stock Commissioners. The report shows, on page 82, that I placed that stallion in quarantine on July 19, 1887. The report shows further that of the 18 diseased or exposed stallions, all recognizably diseased stallions, except Nos. XIV and XV, had died, been castrated or destroyed. Both stallions belonged to Fischer. Fischer, a German, of quite positive notions, had no mares of his own, and refused to permit the destruction of his stallions without legal contest. His neighbors had seen enough of dourine that there was little danger of their violating the quarantine by breeding mares to the diseased stallions and it was virtually impossible for the stallions to be spirited away and used elsewhere for breeding, so the Commissioners quarantined the stallions and waited. As shown in the 1887 report, No. XVI died from castration, without expense to the State, leaving of the original Fischer stallions, only Nos. XIV and XV. The 1888 report indicates, on page 30, that one of these two stallions had died, presumably from drugs administered by Fischer, which he thought might cure the disease. Thus the second Fischer stallion had been satisfactorily disposed of without cost or trouble to the State. Finally, as shown on page 27 of the 1891 report, Fischer mellowed, and after having kept the third stallion in quarantine for about four years, accepted the compensation originally tendered and permitted the destruction of the last known diseased stallion.

#### ALL STALLIONS ACCOUNTED FOR

This accounts officially for the entire list of diseased stallions and indicates that all had been killed or had died and that none had been sold or had otherwise escaped from the infected area. A careful search of the official, and other available records of the outbreak fails to reveal any basis for the statement of Professor Kudo above cited.

One possible explanation for what I believe to be an error on Kudo's part, may be pieced together from other recorded statements. Faville,<sup>2</sup> in his report upon an outbreak of dourine at Gordon, Neb., relates that several stallions and mares were

involved. He describes some of them at considerable length. The history of the one animal which possibly led Kudo into error reads:

Case 1. Black stallion, 8 years old, the property of M. Swigert & Co., of Gordon, Nebr. Horse by Brilliant. This horse was sold by Mr. Dunham of Illinois, as a 2-year-old, to parties near Bloomington, Wis. (Not Bloomington, Illinois). He was brought from Bloomington to Gordon, Nebr., with four or five other stallions, intended for the Indian agency at Pine Ridge, S. Dak., by Mr. J. Newman, and was purchased by Swigert & Co., about Dec. 30, 1890.

A careful reading of this quotation with its context, associated with a fairly accurate knowledge of the environment of the Illinois outbreak, proves beyond question that the stallion, No. XV of the 1887 report and indicted by Kudo, was in no way connected with the Nebraska affair. It also shows beyond reasonable doubt that the colt sold by Dunham was not the bearer of the infection to Gordon, Nebraska.

1. Mr. Dunham, located over 100 miles from the Illinois outbreak, was one of the foremost importers and breeders of Percheron horses of that time, and his imported Brilliant was probably the most famous Percheron sire in America. The animal cited by Faville, was evidently bred by Dunham, at Wayne, Du Page County. Sold as a two-year-old, he had quite certainly never copulated with a mare and hence could not have had dourine. Besides, there is no ground for even a faint suspicion that there was a mare in Du Page county affected with dourine with which he might have copulated.

2. The animal described by Faville was black, not brown. No question of color could possibly arise. No. XV was definitely a brown, not on the border line between black and brown. My recollection of No. XV, after a lapse of forty years, is particularly vivid. If his ghost were to rise up and walk before me now I think I would immediately identify him and at once attempt to verify it by lifting his mane and looking for the brand beneath it.

3. The stallion described by Faville had been in service for five or six years at Bloomington, Wis. There is no record of the occurrence of dourine at that point or in that state, and hence no reason for suspecting that the stallion carried dourine to, or from, Bloomington, Wis.

4. Faville neither stated nor implied that the animal mentioned was a carrier of dourine.

But around Faville's plain statement of fact are interesting possibilities for inferences and assumptions. This possibly may explain the statement of Mohler,<sup>3</sup> nine years later:

The State of Illinois, however, took hold of the outbreak (in De Witt Co.) and as a result of rigid prophylactic measures the disease was eradicated from the state in 1888, *but not before an affected stallion had been shipped to Gordon, Nebr., thereby starting up a new center of infection in that locality.*"

Mohler's language supplies the foundation for the suspicion that he had read into Faville's report, implications for which, so far as I can determine, there was no definite basis. Mohler fails to identify in any way the stallion alleged to have been shipped to Nebraska, and gives no date of shipment. If any diseased stallion was shipped from De Witt County, Illinois, to Gordon, Nebraska, either before or after the official recognition of the disease in 1887, the official reports fail to mention the fact, no such information reached me during my work with the outbreak, and I find no record of such an occurrence elsewhere.

As stated above, I believe that the outbreaks in Nebraska and elsewhere in that region emanated from De Witt County, Illinois, but so far as I can possibly determine, the carriers were the common work mares which had gone in unknown numbers to unknown destinations, prior to June, 1887. Perhaps Mohler only meant to express the opinion that the Nebraska outbreak of dourine emanated from that of Illinois; upon which point we are fully agreed.

It then requires only a bit of imagination so to modify the quoted statement of Mohler to give birth to that of Kudo and make it appear that the Illinois authorities permitted the diseased stallion, No. XV of the 1887 report, to go to a distant state and cause there a destructive outbreak of dourine.

#### SALIENT FACTS RECORDED ANEW

Accordingly, it appears to me important that the salient facts be placed anew before the profession at this time. If Dr. Mohler, Professor Kudo, or others, are in possession of important evidence indicating that serious errors crept into the official reports of the Illinois dourine outbreak, the facts should be definitely recorded by them; otherwise the official reports of the outbreak should be accepted as authentic history.

Aside from the desirability that official reports of the control of contagious diseases should be accepted as authentic, there is another important reason for establishing, if possible, the historical accuracy of the official reports of the Illinois outbreak of dourine. Beginning not far from the date of that outbreak, there arose a tendency, still conspicuous, to abandon, in part, clinical

observation in the diagnosis and control of contagious diseases, and to substitute therefor, instead of adding thereto, bacteriological, serological and other laboratory methods. The Illinois outbreak, occurring before the discovery of the trypanosome of dourine, could be controlled only upon the basis of clinical observation. If, as I claim should be done, the official reports are accepted as true, the disease was brought under control within less than two years. Except for one recrudescence, due to violation of quarantine, and involving but two animals, which were promptly and effectually disposed of, no recurrence of the disease has taken place during the forty years.

Furthermore, if it is granted that the official reports are authentic, no diseased animal escaped or was removed from the affected zone after the official recognition of the disease, in 1887. The control of the disease was prompt, complete and enduring, and stands as a distinct clinical achievement which suffers none by comparison with the efforts at the control of later outbreaks when the officials in charge had at their command the bacteriological, serological and other laboratory methods of diagnosis. No forward-looking clinician has the remotest desire to discard or minimize the value of bacteriological, and other laboratory methods of diagnosis, but there is a not wholly unnatural tendency for some veterinarians to be attracted unduly by the newer standards and to forget that clinical observation is still of very great value—just as valuable now as ever in the history of veterinary science.

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<sup>2</sup>Faville, G. C.: Annual Report U. S. Dept. of Agr., 1891-92, p. 359.  
<sup>3</sup>Mohler, J. R.: Dourine of horses. U. S. Dept. of Agr. Bul. 142 (1911).

#### ILLEGAL PRACTITIONER PROSECUTED

George R. Bowyer, recently of San Diego, Calif., was the first man arrested and charged with practicing veterinary medicine without a license, in California, under the new Veterinary Practice Act. Bowyer pleaded not guilty, was released on his own recognizance, but failed to appear for trial. The Judge issued a bench warrant for Bowyer's arrest and set the bail for \$1,000.00. It is believed that Bowyer has left California. He has a diploma from the old veterinary correspondence school formerly in business at London, Ontario. Such a diploma, of course, is not recognized by the California statute.

## THE PLACE OF VETERINARY MEDICINE\*

By H. A. MORGAN, *Knoxville, Tenn.*

*President of the University of Tennessee*

I am very glad to come to your association at this time to pay tribute to the profession you represent. The public has little information on the type of service you render the commonwealth and that which the profession contributes to our national wealth and the welfare of the human race.

As a profession you have been badly presented. To some extent, though, you are responsible. When veterinary service became a part of the educational program, the horse was over-emphasized and the profession was dominated by horse admirers. The wide range of college courses in comparative anatomy, physiology, pathology and medicine and the unusual opportunity of veterinary practice in live stock development in the agricultural program of the nation could not overcome the emphasis given by veterinarians to horse breeding and management, particularly of the saddle, driving and racing types. So intimately did the profession become associated with the horse that the larger field of veterinary service was unwittingly sacrificed. It was natural, then, that with the advent of the automobile the public and even the profession felt that the "horse doctor" business was about over. The psychology of this whole situation has temporarily brought discouragement and a lack of appreciation for an economic and health service which no other phase of our educational effort can supply. Good horsemanship was too long substituted for scientific training in the treatment and promotion of domestic animals in their relation to agricultural and public welfare. We have come to an important turning-point with respect to veterinary medical service. The time has arrived for intelligent presentation of the place of veterinary studies and practices in the protection and development of American live stock industry and its relation to a successful and permanent agriculture and to a prosperous and healthy people.

No profession has suffered quite so much from the lack of proper educational standards and appreciation of educational requirements. If dumb brutes could enter the courts of this country and the untrained and malpracticing individuals be ex-

\*Summary of an address delivered before the annual meeting of the Tennessee Veterinary Medical Association, Jackson, January 5, 1928.

posed, the veterinary profession would today take rank with human medical practice from the standpoint of educational requirements, public appreciation and economic welfare.

Who have made more efficient contributions than our outstanding veterinarians? The standing of a Grenside, a Pearson, an Alexander, a Dalrymple, a Salmon and many others who might be mentioned is comparable to leaders in other professions and other walks of life. No group of citizens have made larger contributions to American live stock interests than our well-trained and conservative veterinarians. They have not only cured the sick, and prevented and controlled devastating contagious diseases, but they have promoted dairy, beef, swine, sheep and other live stock industries in a way utterly impossible without their intelligent and professional guidance. It is impossible to estimate the value veterinary practice and veterinary information have been to the live stock industry of the United States and Canada. There is no substitute for it. The present lull in interest in the profession is beginning to create anxiety among stockmen, farmers, health experts and those responsible for our vast regulatory and inspectional service, and the inquiry is already broadcast, what agency can take the place of the well-trained veterinarian or how shall the profession be established upon a more inviting basis?

#### FUNCTIONS OF VETERINARY ORGANIZATIONS

Your state and national associations are the avenues through which to establish surveys, accumulate information, begin intelligent propaganda, and prescribe remedial measures. Your interest in the profession is not mainly as a business in which to work out a livelihood. Your main interest is the profession's contribution to economic and social welfare and the success of our state and our nation. May I repeat that no other profession or educational group can take over the fundamental work of the medical doctors of domestic animals.

Those associated with our economic educational program have become greatly concerned about the losses accruing in the veterinary profession. An annual demand of 600 well-trained veterinary doctors with a supply of less than 150 threatens the future of our live stock and agricultural interest and creates serious concern in the health, regulatory and inspectional organizations of this country. For this reason you can command the interest and intelligence of the layman as never before. There is need now

of well-organized information as to the exact situation. The profession can rise only on a well-standardized program of education. The quack and charlatan have already done incalculable injury. Their methods and standards have been repudiated. The public will accept scholarship in domestic animal medical practice as in other callings. Fundamental educational preparation is as essential for the veterinarian as the human physician. The interests of agriculture, live stock and health are demanding the highest educational qualifications. The public is ready to respect, promote and employ trained veterinarians and concede them the professional recognition they merit. Doctors, dentists, pharmacists, lawyers, all have their educational and standardizing committees. The veterinarians must use the same means to create and promote those educational qualifications and standards commensurate with the dignity and economic interest which your calling represents. This calls for immediate action. The Land Grant colleges of the country are vitally interested and offer unusual opportunity for the permanent alignment of our live stock interests and the study and control of all domestic animal diseases. You can not stop malpractice of dumb animals by legislation alone. Public sentiment through proper educational effort is an essential too long neglected. There should be persistent effort to present to the public the contribution of our national wealth which veterinary practice has made and is making.

#### SANITARY SCIENCE INTRODUCED IN RURAL COMMUNITIES

Veterinarians were among the first to interpret science in relation to live stock production and hence to introduce sanitary science to our rural population. The importance of this service extends far beyond the immediate benefits of the economical live stock production and to agriculture. The health and food supply of all the people are involved. The service to the nation of hog cholera studies and control, of tick eradication, of life history studies of *Trichina*, of tapes, of stomach and other round worms, and the discovery of intermediary hosts in the control and even eradication of devastating disease is beyond our ability to evaluate. The public is in need of just such data in order that there may be a full realization of the tragedy that is just ahead if the veterinary profession is permitted any further decline and neglect.

Veterinarians were the pioneers in the study of external and internal parasites and laid the foundation for the zoologists'

interest in the whole field of parasitology. They are responsible for the entomologist's study of biting and sucking lice, fleas, flies, ticks, mites and the large number of insect intermediary hosts of animal and plant organisms. No one is more responsible for the advanced place of bacteriology and protozoology in our health and science programs today than the veterinarian.

Intercommunicable disease, cow's milk and other animal products as media for the development of infected soils as carriers of disease organisms have given much impetus to bacteriological studies and specialization.

The whole service of meat inspection and of sanitation is a contribution the veterinarian may well take pride in. Our live stock breeders have never adequately acknowledged this service. This contribution and its intimate relation to our live stock and agricultural welfare is alone sufficient justification for the alarm that now obtains because of the lapse of interest in the veterinary profession.

#### INTERPRETERS OF SCIENCE TO FARMERS

Veterinary practitioners, like agricultural teachers, have made invaluable contributions as interpreters of science to the farmers and live stock producers. They have taken the discoveries made in the broad field of zoology, bacteriology, and chemistry and developed a practical science of domestic animal medical practice which has found a distinct place in live stock production, sanitation and disease control. It is this field of service the public is anxious to promote and protect. The zoologist, bacteriologist and chemist, as research workers or technicians, are invaluable alike to human and domestic animal medical practice.

In closing, I desire to commit the educational program of the University to the service of rehabilitating veterinary medicine and live stock sanitary service. Our agricultural and live stock studies presuppose the guidance of well-prepared and well-trained physicians of domestic animals and the continued support of a scientifically manned regulatory and sanitary service. We are ready, as are all Land Grant institutions of the country, to join you in any well-organized plan of informing the public of the place of veterinary medicine in the complex of our advanced civilization and to encourage young men to enter this field of humane, economic and scientific endeavor.

I commend you for your unselfish service and for the fine contributions you and your profession have made to our state and national welfare.

## THE LATEST DEVELOPMENTS IN THE STOCK-POISONING PLANTS SITUATION IN INDIANA\*

By ALBERT A. HANSEN, *Lafayette, Indiana*

*Purdue University Agricultural Experiment Station*

Much of our experimental knowledge of toxic plants, particularly in their relation to live stock, is of comparatively recent origin, consequently few Indiana veterinarians have had an opportunity to secure training along this line during undergraduate days.

During the past five annual meetings of this association it has been my privilege and pleasure to present the fundamental facts and principles regarding the poisonous-plant situation in the Hoosier state. With this foundation as a basis, I desire today to bring before you the results of the most important developments along this line during the past year.

### TREMETOL ISOLATED

Particularly noteworthy has been the discovery of the poisonous principle in white snakeroot, *Eupatorium urticaefolium* Reichard, perhaps the most important stock-poisoning species in Indiana. For several years attempts to isolate the toxic principle by the North Carolina Agricultural Experiment Station, the School of Pharmacy of Purdue University, and other investigators have met with failure. During the past year the poisonous principle has been isolated and purified by Dr. James N. Couch,<sup>1</sup> of the United States Department of Agriculture, who discovered the toxin to be a complex alcohol called *tremetol* (so called because it is the cause of trembles in animals), with which are associated two minor poisons, a resin acid, believed to be responsible for cases of winter snakeroot poisoning, and a volatile oil which is toxic to guinea pigs but probably of little consequence as far as farm animals are concerned.

With the discovery of tremetol, a simple method of detecting its presence in milk has been developed, which should be useful to Indiana veterinarians in suspected cases of the poisoning of suckling offspring and to the medical profession where human milk sickness is involved. The method can also be applied to detect the toxin in butter and in the plants themselves. Inci-

\*Presented at the annual meeting of the Indiana Veterinary Medical Association, Indianapolis, January 18, 1928.

dentially, the application of the test to plants growing in different regions has demonstrated the important and illuminating fact that white snakeroot may vary considerably in toxicity; specimens gathered around Washington, D. C., for instance, showing little tremetol content, while plants growing in the vicinity of Lafayette, Indiana, yielded a large amount of tremetol and were extremely toxic. This may explain why, in some sections where white snakeroot is plentiful, practically no stock losses have been experienced.

In performing the test, pour a few cubic centimeters of the suspected milk into a tube and extract the tremetol with petroleum ether, ether, pure gasoline or any other good solvent. If gasoline is used, it should first be tested by pouring slowly on 2 cc of sulphuric acid in a test-tube to make certain that it does not contain impurities that react red with the acid.

Agitate the milk and solvent gently until thoroughly mixed, then allow to stand for a half-hour when the solvent forms a separate upper layer. Do not shake the tube violently or a troublesome emulsion will result. Into another and dry tube pour about 2 cc of concentrated sulphuric acid, then gently decant a few cubic centimeters of the solvent along the inner wall of the tube until a layer about one inch deep floats on the sulphuric acid. Do not allow the milk to enter, or carbonization will result. If tremetol is present a reddish color will form at the junction of the two layers, although if there is but a trace of the tremetol only a faint orange tinge may be discernable. When the tube is shaken the solvent layer assumes a transient reddish tinge while the acid is colored a characteristic cherry red, particularly if the tremetol content is fairly high.

Samples of the fresh plant or of suspected milk or butter may be sent to the Division of Botany, Purdue University Agricultural Experiment Station, Lafayette, Indiana, to be tested. Tremetol, however, is apt to disappear as the plant tissues dry.

#### SWEET CLOVER HAY POISONING

Another recent and important development has been the widespread appearance of sweet clover poisoning in Indiana. Due to numerous red clover failures and the high price of red clover seed, sweet clover has forged to the front as a major crop in Indiana. With it has appeared a new disease of cattle and sheep that is characterized principally by the loss of clotting power of the blood. This is probably of little importance on pasture, although there

is evidence that operations such as castration or dehorning should not be performed while animals are pasturing on sweet clover. It is safer to remove them for a period of three weeks to avoid all danger of death through bleeding. Dr. J. C. Vance, of Indianapolis, has had considerable experience that indicates that heavy pasturing of rank-growing, woody sweet clover may also prove dangerous not only on account of the possibility of impaction but also because of the danger of internal bleeding. This, however, is a matter that needs investigation.

The greatest danger of sweet clover poisoning is in the improper feeding of the hay. A typical case of this character occurred on the farm of Charles Ort, of Woodburn, Indiana, where seven out of a herd of eleven cows died during February of last year, following the liberal feeding of sweet clover hay. The first indication of trouble was the discovery of blood in the troughs, due to nose-bleed in several of the animals. The next symptom noted was a peculiar, stiffened gait and the development of swellings under the skim. These tumors, which appeared on all parts of the body, varied from the size of a pea to that of a football and were at first soft and spongy to the touch, some later becoming hard and solid. No loss of appetite was noted and there was no indication of fever.

During the following two weeks the animals died and the post-mortem revealed that death was due to internal bleeding, the swellings noted being the result of the accumulation of blood under the skin. Hemorrhages were found throughout the body except in the abdominal organs and the blood was of a peculiar color almost exactly like that of rich port wine.

#### SHEEP DEVELOP DISEASE

On the same farm two flocks of sheep were being fed, the western feeders on a grain ration and the Indiana ewes on a diet that included large quantities of sweet clover hay. The animals fed on sweet clover hay developed symptoms practically identical with those observed in the diseased cattle and eight died before the cause of the trouble was ascertained.

Serious outbreaks of sweet clover hay poisoning have been reported in Canada, North Dakota, Minnesota, Illinois, New Mexico, and elsewhere. Investigators have advanced the theory that the trouble is due to moldy hay since the bottoms of most sweet clover hay stacks are practically always moldy and the trouble usually appears when the bottom hay is fed. It must

not be forgotten, however, that by the time the bottom of the stack has been reached considerable of the hay has been fed and there is evidence that the disease is the result of quantity feeding rather than the effect of molds. In a test conducted by the Veterinary Department of Purdue University it was noted that the feeding of clean sweet clover hay to a horse affected the blood until it lost its clotting power.

Two suggestions have been made for the prevention of sweet clover hay poisoning. The first is to alternate the feeding of the hay every two weeks—that is, do not feed it for a greater period than two weeks at a time. The second suggestion is to prevent the trouble by not allowing more than 25 per cent of the ration to be sweet clover hay. When fed in small quantities there seems to be no danger of the development of sweet clover hay poisoning.

Schalk reports that, in North Dakota, nursing calves have been affected through the dams' milk. In this respect it resembles white snakeroot poisoning in Indiana. The toxic principle in sweet clover has not as yet been discovered although some experimental work along this line is being performed.

Indiana veterinarians should not discourage the use of sweet clover, which is a valuable crop, but they should discourage the improper feeding of the hay. As a matter of fact, sweet clover is primarily a soil improvement and pasture plant under Hoosier conditions rather than a hay crop, although many Indiana farmers utilized it for hay during the past season.

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<sup>1</sup>Couch, J. F.: Directions for making pathological tests of materials suspected of causing milk sickness. Jour. A. V. M. A., lxxi (1927), n. s. 24 (6), pp. 774-775.

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### *Minneapolis, City of Lakes and Gardens*

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#### SEASONAL VARIATIONS IN VITAMIN CONTENT

That watercress, the familiar garnish for meat and salad, is a remarkably rich source of the vitamin necessary for growth and of the scurvy-preventing vitamin C, has been found by Dr. Katherine H. Coward and P. Eggleton, of the University of London. It boasts of small quantities of vitamin D, as well, in its small green leaves. The green shows considerable seasonal variation, however, in its growth-promoting properties, being more effective with laboratory animals in this respect in spring and summer than in winter.

—*Science.*

## MINERALS IN SWINE FEEDING\*

By H. H. MITCHELL, *Urbana, Illinois*

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The mineral requirements of swine can be met by the proper selection of feeds, but under certain conditions it may not be expedient to supply all of the minerals needed in this way. The feeding of mineral supplements will be profitable when swine rations are composed too largely of grains and grain products, particularly in the case of growing pigs and of pregnant and lactating sows.

Corn and probably all grains and most of the vegetable feeds are deficient in one or both of the elements found in common salt, *i. e.*, sodium and chlorine. Swine should therefore have access to salt, either as a component of a mineral mixture or of ground feed. The use of iodized salt for this purpose may be recommended as an insurance against iodine insufficiency and thyroid hypofunctioning. This part of the country is in a semi-arid region, so that the added expense of iodized over common salt may be justified. However, in using iodized salt, the danger of losing iodine from it, due to careless methods of storage, should be appreciated. Unnecessary exposure to air, heat or light should be avoided.

Aside from common salt, the most general deficiency of grain rations is a deficiency in calcium. Calcium may be supplied in such feeds as tankage, skim milk and legume pastures, or in mineral supplements such as limestone, marl, whiting, wood ashes, rock phosphates and bone preparations. These supplements contain calcium in either the carbonate or the phosphate form. Since phosphorus is rarely if ever deficient in whole grain rations, it is largely immaterial which salt of calcium is fed. When fed in considerable amounts, phosphates are better tolerated than carbonates.

Limestone, marl and whiting contain calcium in the carbonate form. They are very variable in their content of calcium, due to contaminations with clay or other debris, or, in the case of limestone, with magnesium carbonate. The dolomitic limestones may contain as much as 50 per cent of magnesium carbonate. It was thought until recently that any considerable contamination

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with magnesium carbonate rendered a limestone unsuitable as a mineral feed, on the theory that the magnesium seriously impaired the utilization of calcium. It has been shown at the University of Wisconsin, however, that this is not true, and that dolomitic limestones are as good as non-dolomitic limestones per pound of calcium contained in them.

Wood ashes are extremely variable in composition, and may contain from 20 per cent or less to over 65 per cent of lime or calcium oxid. While their value as a source of calcium in swine feeding has not been definitely determined, there appears to be no reason to doubt their usefulness in this respect.

#### ROCK PHOSPHATE AS A SOURCE OF CALCIUM

Rock phosphate as a source of calcium in animal feeding has given variable results, generally unfavorable. The differences in the results obtained are probably due to differences in the kinds of rock phosphate on the market, and the generally unfavorable character of the results of rock phosphate feeding is probably traceable to the fluorin almost universally present in mineral calcium phosphate deposits. There are rock phosphates on the market which are very finely ground for direct application to the soil. These preparations contain about 2 per cent of fluorin. There are other rock phosphates that are unwashed and relatively coarsely ground, which contain close to 3 per cent of fluorin, while apatite, the purest calcium phosphate mineral, contains 3.8 per cent of fluorin, in its most usual form. Experimental work has definitely shown that fluorin may interfere with calcium utilization in the animal body, and may even cause calcium withdrawals from the skeleton. Hence, the poor results obtained generally with rock phosphate as a mineral supplement to animal rations are not surprising. It is, however, quite possible that the washed phosphate rock is a good and an economical calcium supplement.

Bone preparations, such as green bone, bone ash, spent bone black, and particularly steamed bone meal, have given excellent results in animal feeding and are undoubtedly among the best sources of calcium. The only objection that can be made to them is their relatively high cost, as compared with calcium-containing mineral fertilizers.

The addition of salt, iodine, and a good calcium supplement to grain rations for swine should be a sufficient safeguard against mineral deficiencies of general occurrence, according to available

information. However, other mineral deficiencies may in the future be shown to occur in swine rations. The possibility of an iron deficiency in grain rations has been investigated experimentally. Definite indications that iron compounds might be of benefit in animal feeding were published by the Rowett Institute of Animal Nutrition, at Aberdeen, Scotland, in 1924. According to these experiments, suckling pigs may develop a condition which is mainly characterized by anemia, and certain circulatory and respiratory disturbances, when the sow is being fed a ration containing no iron-rich supplement, and is being confined with her litter indoors. In an experiment with one sow and her litter, the feeding of iron oxid to the sow appeared to avert this trouble in the pigs. The Purdue Agricultural Experiment Station has reported recently the experimental production of anemia in suckling pigs, apparently similar in all respects to that obtained at Aberdeen. However, neither iron salts nor iron-rich tankage exerted any distinctly favorable curative or protective effects. The condition appeared to be related to the conditions of indoor confinement rather than to the ration fed.

#### IRON-FEEDING EXPERIMENTS

At the Ohio Experiment Station they have performed a number of experiments on growing pigs after weaning in which either ferric oxid or ferrous sulfate was added to various rations, some of which contained tankage. In four of six trials with ferrous sulfate (copperas) better average growth was obtained with the iron-fed pigs than with their controls. In two experiments with ferric oxid contradictory results were secured. Iron-feeding experiments at the Iowa Experiment Station have not been, with one exception, sufficiently well controlled to indicate whether the copperas included in some of the experimental mineral mixtures has or has not produced a favorable effect. In one experiment with Venetian Red, containing over 60 per cent of ferric oxid, more rapid and economical average gains were obtained than with no iron addition, although the basal ration contained tankage.

During the last year, the Swine and Nutrition Divisions at the University of Illinois conducted a somewhat extensive investigation on the value of copperas as a supplement to (1) a ration relatively high in iron because of its content of tankage and (2) a ration poor in iron consisting entirely of vegetable feeds. Our results were entirely negative with the low-iron ration, while with

the high-iron ration the results indicated an actual retarding effect of the copperas on the growth of the pigs.

Taking into consideration all of the experiments on iron feeding, there appear to be no grounds for believing that the addition of iron salts to grain rations is either necessary or beneficial. It is, perhaps, natural to think of iron-deficiency in considering the etiology of anemia, but the current trend of recent work favors the view that other factors may be more potent in causing this condition. Furthermore, where iron salts have been found to be effective, ferric oxid and ferrous sulfate have given poor results as compared with other salts of this metal.

#### COPPERAS OF DOUBTFUL ANTHELMINTIC VALUE

It may not be out of place to consider briefly other substances than those of proven nutritive value that are frequently included in mineral mixtures. Copperas is often put into such mixtures to retard or to prevent the growth of intestinal parasites. However, insofar as I have been able to discover, the value of copperas as an anthelmintic has never been experimentally demonstrated. The U. S. Department of Agriculture and the Ohio Experiment Station have tested the anthelmintic value of copperas with negative findings, and in the Illinois experiments above referred to, a continuous daily dose of 1 gram of copperas made no perceptible difference in the worm infestation of the pigs. In one experiment on copperas feeding, by Withers and Caruth, a daily dose of 9 grams of copperas for 127 days did not prevent a heavy infestation of intestinal parasites in pigs. Before leaving the subject of worm remedies, the question may well be raised whether it is advisable to include any drugs of this character in the daily ration of pigs, particularly in mineral mixtures that are frequently self-fed.

The use of such inert substances as charcoal and sulfur in mineral mixtures seems difficult to justify. The supposed value of charcoal in alleviating certain digestive disorders cannot be properly urged in support of its general use for animals not so afflicted. The function of sulfur in the daily feed of an animal is also difficult to appreciate. In experiments with growing laboratory animals, small additions of sulfur to the ration have produced toxic symptoms, evidently due to the hydrogen sulfid produced from sulfur by the intestinal bacteria. The self-feeding of mineral mixtures containing any considerable amount of sulfur may thus easily prove harmful.

Mild laxative salts, such as Epsom or Glauber's salts, are frequently included in mineral mixtures for no good reason at all. Grain rations contain 2 per cent or more of crude fiber, which ordinarily should be sufficient to insure proper regulation of bowel movements. Occasional cases of constipation or of sluggish bowel movements should be treated as they occur, by changes in the ration or by some effective method of purging. It is extremely improbable that the amounts of purgative salts that would be consumed in a mineral mixture would be at all effective unless they constitute such a large fraction of the mixture that its value for any other purpose would be seriously impaired.

The agricultural experiment stations in this country have in the main subscribed to the proposition that a mineral mixture is justified only insofar as it supplements the nutritive value of the ration with which it is fed. The addition to it of drugs or tonics possessing no proven nutritional value seems irrational and may prove to be harmful. In any case it adds to the cost of the mixture without assuring any added returns from it.

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Nature's time-piece—Old Faithful Geyser, Yellowstone National Park.

## MORTALITY IN CHICKENS FOLLOWING THE FEED- ING OF MASSIVE DOSES OF VIRULENT FOWL TYPHOID BACTERIA\*

By W. V. LAMBERT and C. W. KNOX

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In connection with a study to determine the part that inherited factors may play in resistance to fowl typhoid, the authors have had occasion to observe on a rather large scale the mortality due to this disease following the feeding of massive doses. Since very little information is on record concerning mortality due to this disease, it is hoped that the following observations may be of value.

Kaupp and Dearstyne<sup>1</sup> have reported most extensively on the mortality of this disease under field conditions. From a study of 56 flocks in which the disease occurred, they report the mortality ranging from 1 to 100 per cent previous to vaccination. The average mortality was 26 per cent.

After vaccination the loss in these same flocks varied from 0 to 27 per cent, with an average flock loss of 3.8 per cent. The total loss, both before and after vaccination, amounted to 28.9 per cent. D'Herelle<sup>2</sup> states that the annual mortality in France amounts to from 40 to 70 per cent of the population of the infected poultry-yards. Van Es and Martin<sup>3</sup> state that affected birds rarely recover.

The studies reported herein were made over a period of three years and all the birds used were single comb White Leghorns, for the most part, ranging in weight from two to three pounds. The results of the three years' tests are shown in table I.

All of these birds were given a massive dose of fowl typhoid bacteria per os. Each bird, with the exception of the females in the 1926 group, was fed 6 cc of a 20-hour infusion broth culture of the organism. The females used in 1926 were given only 3 cc of the culture. The birds were fed by means of a catheter and a small funnel. The catheter was inserted into the crop, thus insuring that each bird received an equal amount of the same culture.

\*Paper No. 19 from the Department of Genetics and No. 16 from the Poultry Husbandry Department, cooperating.

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Of the 220 birds inoculated during the three years, 105, or 47.7 per cent, died. Considerable variability in total mortality was shown in the different years, this ranging from 55.1 per cent, in 1924, to 41.8 per cent, in 1925. In 1925 and 1926, the number of females that died was much less than the number of males. In 1924, however, the situation was reversed, although in this case the number of males is hardly sufficient to be indicative. No reason for the greater mortality of the females in 1925 can be given, for in the opinion of the writers both males and females appeared equally vigorous at the time of the infection. In 1926, as noted previously, the females received only half as much of the culture of the organism as did the males and this possibly may account for the difference observed in this case.

TABLE I—*The mortality in a population of White Leghorn fowls when infected per os with a massive dose of fowl typhoid bacteria*

YEAR	TOTAL IN- FECTED	SEX	MORTALITY AT VARIOUS INTER- VALS FOLLOWING INFECTION											TOTAL DEAD	% DYING
			1- 5	6- 10	11- 15	16- 20	21- 25	26- 30	31- 35	36- 40	41- 45	46- 50			
1924	9	Males		1	2								3	33.3	
	49	Females	1	2	8	2	7	2	1			1	24	55.1	
1925	19	Males		1	4	1	4						10	52.6	
	43	Females		1	5	1				1			8	41.8	
1926	60	Males		12	11	7	1	5					36	60.0	
	128	Females		11	5	4	1			3			24	46.9	
Totals	220		1	28	35	15	13	7	1	4		1	105	47.7	

Just what relation there may be to the degree of exposure is not certain, but in this case the number of organisms fed was extremely large, many times larger, undoubtedly, than a bird ever receives in a field infection.

In table I, the mortality rate has been listed in 5-day intervals. It will be noted that the heaviest mortality occurred between the sixth and fifteenth days, 63 of the 105 birds having died during this interval. In the interval from the 15th to the 25th day, the mortality was still quite heavy, after which it rapidly diminished. One bird died on the fifth day after infection and one on the 47th. The latter was a chronic case which upon autopsy showed mild lesions of typhoid. An attempt to secure a culture from

the liver proved unsuccessful. The bird that died on the fifth day after infection showed unmistakable lesions of typhoid.

Of the total number of birds that died in 1924, five had chicken pox as a complication and one showed pneumonia on autopsy. Of the birds that recovered, four were affected with chicken pox during the course of the disease. In 1925 no complications were reported, but in 1926 five of the birds that died showed some bronchitis and one had chicken pox. Colds were observed, also, among a number of the birds that recovered.

The birds were graded by the authors, according to their general appearance, into three classes, and the mortality for these three classes was determined. Of the total number of birds tested, the condition of 206 was listed as good, 12 as fair and 2 as poor. Out of the 105 birds that died, 96 were listed as in good condition, 7 as fair and 2 as poor. It would seem from these observations, that within reasonable limits, the condition of the bird may influence its reaction to the disease.

There were 115 survivors out of the 220 birds infected and 105 that died. Practically every bird infected showed a susceptibility to the disease as measured by temperature and general condition, although there were a few that showed no clinical symptoms. There was much variability in the degree of reaction as shown by the clinical observations in both the birds that died and those that recovered.

These results would seem to contradict the statement of Van Es and Martin that affected birds seldom recover. Many of the birds that recovered have been used in the breeding flock. Their production and hatchability have been as good as those of similarly bred birds that were not subjected to the disease.

While the mortality reported herein is greater than the average reported by Kaupp and Deerstyne, it is not so high as the death-rate noted in some flocks by them. One of the most important factors probably influencing the mortality observed in flock infections is the virulence of the infecting organism. In the studies reported here, this has been controlled as completely as possible. Before being used on the birds in the experiment, the infecting organism was fed to several chickens and only after it had proved its virulence by killing at least 75 per cent of the birds infected was it used.

Another reason for the great variability reported in natural outbreaks of this disease may lie in the individual inherited differences in resistance existing within different flocks. Roberts

and Card<sup>4</sup> have reported upon differences in resistance to bacillary white diarrhea in chicks from various flocks, Pritchett<sup>5</sup> has found slight differences in the degree of resistance to mouse typhoid in several inbred strains of mice, and Wright and Lewis<sup>6</sup> have observed rather marked differences in resistance to tuberculosis among inbred strains of guinea pigs.

The exact role of inborn factors for resistance or susceptibility to the different diseases is as yet unknown, for practically all studies to date have considered only the variability in the infecting organism, and have more or less neglected the variability due to the inherent differences in resistance of the different hosts. Due to the complexity of resistance, however, any studies attempting to assign a role to inborn resistance must be carefully controlled from the standpoint of degree of infection, virulence of the infecting organism, condition of the infected animals, and general environment.

#### ACKNOWLEDGMENT

The writers wish to express their appreciation to Drs. Chas. Murray and S. H. McNutt, of the Veterinary Investigation Department, for isolating the organisms used in these trials, for performing all autopsies and for many valuable suggestions.

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Tennessee veterinarians in annual session at Jackson, January 5, 1928.

## VULVOVAGINITIS IN SWINE

### Preliminary Report

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During the early summer of 1927, reports of a condition described as affecting the external genitalia of swine began reaching us from certain parts of the state. The condition became more prevalent as summer advanced and began to subside in numbers of new cases in the late fall and early winter. A few isolated cases have occurred throughout the winter. The disease is reported principally from Illinois, Minnesota and parts of Iowa. It has also been observed in Indiana and South Dakota and no doubt was present in other parts of the country. In Iowa, the disease is reported only from the northeastern part of the State. The southern boundary of the affected area, starting from Clinton, proceeded west to about twenty miles west of Cedar Rapids and then northwest to Estherville, Iowa. This line, together with the north boundary of Iowa, includes a wedge-shaped portion of the State and in all of this territory vulvovaginitis was commonly observed. However, it was most commonly reported and was most severe in the counties of Dubuque, Linn and Chickasaw. Only one case was reported as far west as Estherville.

The term "vulvovaginitis" covers the main pathological changes observed in affected animals and for that reason is used here. Vaginitis alone cannot be used because the condition primarily is an inflammation of the vulva, seeming to affect the vagina only secondarily and then only the posterior portion. Vulvovaginitis does not cover prolapse of the rectum, which appears to be also a secondary lesion, nor does it include inflammation of the prepuce. Reference in the literature to vaginitis or vulvitis of sows, particularly infectious vaginitis, is lacking. In reviewing the literature it is surprising to note that hogs are especially free from specific and non-specific diseases of the genital tract, but particularly free from inflammatory conditions of the vagina. It appears that there never has been an infectious vaginitis recognized as such in sows. Not only

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is this true but sows are particularly resistant to infections and other factors that might produce vaginitis.

The hog then, apparently, is the only common domesticated animal that has not been subject to this condition in an infectious form. Animals affected have been mostly young gilts, although there are often a number of boar pigs or barrows that show some inflammation of the prepuce, but since the male pigs are apt to be affected with a sporadic, mild, non-specific inflammation of the prepuce, the evidence is not strong enough to state certainly that such is analogous to vulvovaginitis in the female. However, inflammation of the prepuce is very common in affected herds. Prolapse of the rectum has not been noted in males and is an indication that the anus and rectum are not affected, except secondarily, and then only in a mechanical way, where prolapse of the vagina already exists. Young suckling female pigs also are affected, although not seriously. Gilts from six weeks up to 100 or 150 pounds in weight are most often affected. Sows over a year old sometimes show or seem to show a slight enlargement of the vulva. Such changes due to the heat period might be confused with the condition in mature animals. No other species of animals on farms where the disease occurs show any vaginitis or vulvovaginitis. It would appear that the condition is specific for pigs.

If we exclude a mild inflammation of the prepuce in the male as a possible lesion of the disease, the lesions are confined to the vulva, posterior part of the vagina and to the rectum and anus. The first change to be noted is a gradual enlargement or swelling of the vulva. It seemingly differs in no way from enlargement of the vulva due to the heat period, but the swelling continues until the vulva is smooth, very firm, tense and elevated or swollen out from the body. Then it is that the lips separate and the vaginal mucosa, only slightly injected or reddened, begins to show. The inner portions of the vulva and vaginal mucosa continue to swell until the mucosa protrudes through the lips of the vulva. The weight of the prolapsed portion drags the more anterior portions out. Return circulation is partly checked, resulting in passive congestion and distention of the prolapsed organs. Up to this time congestion or hyperemia has not been marked and only occurs due to constriction of the blood-vessels by the swollen vulva.

The prolapse may extend out a distance of six inches and have a diameter of four inches. Due to its exposed position and the

resulting irritation, pigs are inclined to rub, causing injury. The parts become bloody, eroded, purulent and highly injected. In these respects the prolapse does not differ from prolapse from other causes. Death may result from hemorrhage, septic infection, urinary poisoning or infection of the bladder, ureters or kidneys. The anus shows no evident inflammation until the rectum begins to prolapse. Prolapse of the rectum in this disease does not differ from prolapse from any other cause, and occurs only after severe swelling of the vulva or prolapse of the vagina and is evidently produced by straining, rubbing, and mechanically by pressure from the swollen parts below the rectum. Prolapse of the rectum occurs in about 5 to 10 per cent of the cases, while prolapse of the vagina occurs in a larger percentage, in some herds as high as 30 per cent.

There are no marked general symptoms and no pain except in cases of bad prolapse. There is little or no discharge or exudate from the anterior portion of the vagina. Until affected by some secondary condition the pigs seem thrifty, are active and eat well. Autopsy of animals killed in the height of the disease shows the ovaries, tubes, uterus, cervix, kidneys, ureters and bladder to be normal. The urethra is inflamed only when it has been dragged back by prolapse of the vagina. In fact, all organs except those visible from the exterior are grossly normal. The anterior portion of the vagina is nearly free of inflammation, with only a few cells and flakes of exudate and without any marked evidence of purulent material. In making cultures from the vagina of infected pigs considerable mucus was noted. Swelling and tenseness of the affected parts is due mostly to edematous fluid and cellular infiltration.

Autopsy of gilts that have died of the disease shows that death has been due to secondary conditions such as septic cystitis, uremic poisoning or constipation and septicemia following necrosis of the exposed prolapsed parts. Death has not resulted except in cases of prolapse and then only from secondary causes as noted above. There may also appear a slight enlargement of the mammary glands in some affected gilts. Stimulation of sexual desire has not been noted except in experiment pigs that were of such an age they might have come in heat had they not been on experiment.

After study of several cases three possible causes of the condition appeared to merit our consideration and were therefore investigated. They were:

- (1) Bacterial infection.
- (2) Plant poisons or toxic materials in plants growing in pastures.
- (3) Toxins in feeds.

#### BACTERIOLOGICAL STUDIES

Since the condition was an acute inflammation and since most acute inflammations of these parts are caused by infection, one's thoughts naturally incline to such as the cause. Attempts were made to transmit the disease by direct contact. Affected gilts removed from farms where the disease had developed were placed with small healthy gilts but failed to transmit the disease by contact. Healthy gilts so exposed remained normal throughout a six-weeks period of observation. During that period the affected gilts returned to nearly normal. Not only was this the case but following exposure the unaffected, exposed gilts were placed in yards with 25 other young pigs and the disease was not contracted by these animals over an observation period of six months.

Attempts were made to transmit the disease artificially. Affected gilts, during the height of the disease, were douched with 100 cc of normal saline solution. Such material came away only very slightly milky and in it were suspended numerous flaky particles. The collected douching fluid was, by means of a catheter and funnel, allowed to gravitate into the vagina of healthy gilts. Over an observation period of 6 weeks there was no indication that the disease had been transmitted. These exposed pigs were placed in a herd of young pigs and the disease did not develop during an observation period of six months.

Attempts also were made to transmit the disease to rabbits and guinea pigs. Affected gilts were douched with 100 cc of normal saline solution and such collected douching fluid was injected intraperitoneally into male and female guinea pigs and into male and female rabbits in doses varying from 1 to 3 cc each. None of these animals showed the slightest inconvenience and no local symptoms over an observation period of two months.

Bacteriological study of the vagina of affected pigs showed a streptococcus predominating. A coccus occurring in pairs also was present but to a less extent. A few polar-staining organisms also were present. These organisms, both in pure and mixed cultures, were injected intraperitoneally into both rabbits and guinea pigs without effect nor were there any local symptoms. Further study of these organisms was not made because it was

apparently evident that they were not the cause of the condition. Not only were they incapable of causing the disease but they were non-virulent for laboratory animals. It is interesting to note that the rod-shaped organism mentioned above corresponds morphologically and in its behavior toward guinea pigs to the organism isolated by Jones and Little, of the Rockefeller Institute for Medical Research, as the apparent cause of granular vaginitis of cattle.

In the various forms of infectious vaginitis of other animals the disease is very easily transmitted and it is usually our problem to determine how to prevent its spreading rather than to experience difficulty in causing it to do so. With this in mind, it would seem reasonable to assume that vulvovaginitis in gilts is not infectious. Further evidence is presented in that the disease occurred over large sections of the country almost simultaneously. There had been little or no traffic in hogs. On farms where the disease occurred there was no evidence to show that the disease was introduced with infected pigs or even from pigs not showing disease. We have few, if any, infectious diseases of any nature that spread so rapidly as did vulvovaginitis.

#### POISONOUS PLANT STUDIES

With infection apparently eliminated as a possible cause of the condition, it was thought that some toxic or poisonous plant might be responsible or that some plant, due to some unknown condition, had developed toxic or poisonous properties that would cause the condition. Perhaps this idea was partly entertained because of the cocklebur poisoning that had occurred only a few months before. The reports of the latter condition came from the states south of Iowa, then from southern Iowa, then central Iowa and finally in northern Iowa and disappeared into Minnesota and the North. It came like a wave from the South and continued in its direction to disappear in the North. Its occurrence was dependant on the germination of the burrs. Evidently the season was ideal for this.

First reports of vulvovaginitis were from the Southeast, although, as was learned later, cases occurred almost at the same time over large sections of the country. Many different plants were sent to Dr. L. H. Pammel, of the Botany Department, Iowa State College, for identification and for his opinion whether they would produce or ever had been known to produce vaginitis.

Trips to several farms were made. Fortunately only well-known plants were found and it was possible for Dr. Pammel to render a reliable statement without experimentation. Some of the plants were catnip (*Nepeta cataria*), the nettle-leaf vervain (*Verbena urticaefolia*), the Indian mallow (*Abutilon theophrastic*), and the dragon-head (*Dracocophalum parviflorum*). Other plants examined were the small ragweed, sneeze weed, the common black nightshade, and the smart weed or pepper. Dr. Pammel writes:

While some of the plants are slightly toxic, they are not sufficiently so to cause the condition (vulvovaginitis) found in the animals. I have come to the conclusion that the trouble is not due to any weeds found.

He further intimates that all plants common to the localities were evidently found in his survey and that the condition is not due to any plants or changes in any plants growing in the pastures or yards. As further evidence to this effect it is to be noted that some of the hogs were not on pasture, some herds being confined in dry lots.

#### STUDIES OF FEEDS

Together with the above work, experiments with feed were carried out. All the various feeds, including grains and supplements, were regarded by different owners as the possible cause of the condition and in many cases the owners felt very sure that a certain feed was the cause. However, it was determined that the only feed given to all affected herds was corn and it appeared reasonable to investigate it first. We are indebted to a farmer, living near Dubuque, and to Dr. J. T. Gilloon, of Dyersville, Iowa, for our first definite information in regard to corn. On August 11, 1927, Dr. Gilloon wrote:

I am sending you a sack of corn which I think is the trouble. A farmer started to feed this corn and in a week all gilts were affected. He sold a load of the corn to another hog-raiser whose gilts also became affected. Another farmer, living near Dubuque, suspected his corn was at fault and bought corn until his hogs had recovered and when he returned to feeding his own corn the trouble promptly showed up.

On the evening of August 16, 1927, two gilts weighing 25 pounds each were given their first feed of the above corn and from that time on they were fed nothing but this corn and water. Six days later, or on August 22, it was found that the vulva of each was swollen to eight times its normal size. Two other normal gilts weighing 25 pounds were placed on the feed and kept under close observation. One of these gilts showed some swelling of the vulva within three days and both showed a marked

swelling in five days. The pigs were taken off feed when the condition showed in both. Another sample of 50 pounds of ear corn, crib-run from a different source, was fed to four pigs averaging 40 pounds without causing any ill effects. From feeding experiments with this sample of corn it was concluded that only the badly spoiled and molded corn produced the condition. In crib-run corn it would doubtless require a longer feeding period to produce the condition.

The substance that produces the trouble seems to be slightly cumulative. With this in mind we requested that selection be made of moldy ears from cribs. A sample of corn, received January 17, 1928, and fed on February 2 to two normal gilts of 48 pounds weight, produced swelling of the vulva in four days in one gilt that ate more readily and in the second gilt in six days. At six days the corn feeding was discontinued but swelling and enlargement of the vulva in each continued for four days longer until the organs were tense, smooth and tumefied. In the pig that first showed the condition, beginning prolapse of the vagina took place before the process began to subside.

No reports of the trouble have been made except where the pigs have been fed corn from the 1926 crop. The trouble was experienced with both white and yellow dent corn but only in case the corn was quite badly spoiled. Such samples appeared grossly as ordinary spoiled corn. Mold was very evident, but since molds on different feeds have so seldom been found to cause trouble it would seem more likely that spoilage due to organisms other than mold should be suspected rather than the more evident and more spectacular vegetable growth. Since it is not known what organism causes the detrimental changes in corn, it seems a little premature to say that vulvovaginitis is caused by moldy corn, unless that statement is based on the understanding that all naturally spoiled corn will necessarily be moldy. It would seem entirely proper to state that the condition is produced by spoiled corn.

The growing season for corn in the state of Iowa in 1926 was about 144 days, or a shorter period than the average. This was nearly uniform over the entire state. Since vulvovaginitis occurred in only one section of the State the growing season alone was not the main cause of spoilage, but it is true that the corn in northeast Iowa was more backward than in any other part of the State. Table I shows the quantity of corn matured without frost damage and the quantity of merchantable corn

for each section of the State, supplied through the courtesy of Chas. D. Reed, Director, Iowa Weather and Crop Service.

TABLE I—*Data on merchantable corn*

DISTRICT	PERCENTAGE OF CROP MERCHANTABLE	PERCENTAGE MATURED WITHOUT FROST DANGER
North East.....	54	52
North Central.....	71	67
East Central.....	72	67
South East.....	73	69
South Central.....	71	70
Central.....	77	72
West Central.....	79	75
South West.....	79	81
North West.....	80	78
State average.....	74	71

It will be seen from the table that those sections having the most trouble with vulvovaginitis also had the greatest percentage of poor corn. Most of the trouble was in the northeast district, some in the north central district and a little in the east central. For instance, Chickasaw County in the northeast district had only 35 per cent of its corn crop matured without frost damage and Fayette County only 36 per cent with only 37 per cent merchantable. In both these counties there was considerable trouble. This is to be compared with Fremont County, where there was no vulvovaginitis and where 87 per cent of the crop was merchantable and 89 per cent not injured by frost. Two counties, Blackhawk and Bremer, in the northeast district, had very little trouble from the disease and these had a high percentage of good corn not injured by frost. Another fact of interest in regard to the weather of 1926 is that September was the wettest and most cloudy of any September on record, which covers a period of 54 years. More rain fell in September than in any other one month of this or any other year during the period of observation in Iowa.

The question has been raised as to what effect the disease would have on breeding of recovered animals. Pure-bred raisers have been fearful that recovered gilts would not breed. Since the disease is confined to the more external portions of the genital tract and since following recovery there is no abnormality that could prevent breeding there seems to be no likelihood that the disease need be any factor in the breeding of recovered gilts.

### CONCLUSIONS

Vulvovaginitis in gilts has been found apparently due to feeding spoiled corn but it cannot be said definitely that mold is responsible for the poisonous properties that develop.

### BUREAU TRANSFERS

Dr. Henry Singleton (K. C. V. C. '06), from Houston, Texas, to Cedars, Miss., in charge of meat inspection.

Dr. Walter W. Shartle (Ind. '09), from Houston, Texas, to Baton Rouge, La.

Dr. Nelson D. Hatcher, Jr. (St. Jos. '20), from Baton Rouge, La., to Jackson, Miss., on tick eradication.

Dr. E. N. Moline (K. C. V. C. '11), from Jacksonville, Fla., to Jackson, Miss., on tick eradication.

Dr. Chas. E. O'Neal (K. S. A. C. '16), from Fort Worth, Texas, to Jackson, Miss., on tick eradication.

Dr. F. L. D. Herchenroeder, Jr. (St. Jos. '18), from Fort Worth, Texas, to Jackson, Miss., on tick eradication.

Dr. Fred E. Rambo (Ind. '11), from Baton Rouge, La., to Jackson, Miss., on tick eradication.

Dr. Fred H. Schaefer, from Kansas City, Kans., to Fort Dodge, Iowa, on virus serum control.

Dr. Charles Walter, from tuberculosis eradication to virus serum control, at Indianapolis, Ind.

Dr. John T. Draper, Jr. (K. C. V. C. '17), from meat inspection to virus serum control, at Omaha, Nebr.

Dr. Wilber C. Finn, Jr., from Omaha, Nebr., to Chicago, Ill., on meat inspection.

Dr. O. E. Allmon, from Chicago, Ill., to Sioux City, Iowa, on virus serum control.

### ON THE WAY TO MINNEAPOLIS



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## BOVINE SUBCUTANEOUS TUBERCULOSIS

By CHAS. A. MITCHELL, *Ottawa, Canada*

*Pathological Division, Health of Animals Branch, Department of Agriculture*

Within recent years a large and increasing number of animals have been subjected to tuberculin tests, due to the various eradication measures adopted by different countries. This widespread application of tuberculin has brought with it many new problems in the field of tuberculosis control which previously went unobserved or seemed to have little bearing upon the subject, one of which is indicated by the title of this paper.

Subcutaneous tuberculosis—this has usually been referred to as skin lesions—compares in some respects with tuberculides of human beings. But this, unlike tuberculides, has received scant attention from clinician and research worker alike, until the various eradication measures and the resultant intensive study of tuberculosis forced this problem to the surface.

A perusal of the literature shows very little reference to this type of infection until recent years. In 1914, an extract was published in the JOURNAL of the American Veterinary Medical Association,<sup>1</sup> said to be from the French literature. In this extract was pointed out the rarity of the disease and also that the lymph-glands adjacent to the affected area were seldom involved.

In 1916, Traum<sup>2</sup> published an account of a disease which clinically somewhat resembles subcutaneous tuberculosis. It occurred in California and he believed it was caused by a streptothrix. In 1919, Traum<sup>3</sup> described an organism which he isolated and which he believed to be the cause of the disease. Day,<sup>4</sup> in 1922, recorded several cases which came under his observation. He also stated that he produced tuberculosis in guinea pigs inoculated with the lesions from cattle. Wright,<sup>5</sup> in 1921, recorded seven cases and pointed out that the extremities were most often affected. Traum,<sup>6</sup> in 1923, described the organism isolated by him and which he believed caused the majority of cases of subcutaneous lesions. Hastings, Beach and Weber,<sup>7</sup> after studying twenty-three lesions and being unable to grow the organism or to infect laboratory animals, concluded the lesions were not due to the tubercle bacillus but possibly to an allied acid-fast organism.

<sup>1</sup>Received for publication, March 28, 1928.

Carpenter and Goldberg<sup>8</sup> believed that cutaneous lesions of cattle were identical with skin lesions of man. They also pointed out that the introduction of a small amount of bovine bacilli produced a lesion which resembled that found in natural infection. Elder and Lee<sup>9</sup> also produced, with avian tubercle bacilli, lesions resembling natural infection. Calmette,<sup>10</sup> in his text-book, points out that tuberculosis of the skin in cattle is exceedingly rare, and that acid-fast organisms found are of a very low virulence. Crawford,<sup>11</sup> in his excellent study of tuberculin sensitization by acid-fast organisms (other than tubercle bacilli), concluded that the reactions as a whole were inconsistent and decidedly atypical but in a few cases they closely paralleled specific tuberculin reactions.

About two years ago, the study of subcutaneous tuberculosis was commenced at this laboratory. It was deemed advisable in addition to the purely experimental work to collect all possible data with reference to the specimens and to tabulate them in such a form that light might be thrown on the epizootology of the disease and on its relationship to tuberculosis as a whole. Table 1 is self-explanatory and should be studied in connection with this paper.

It appears from table 1 that subcutaneous tuberculosis (1) sensitizes an animal to tuberculin, (2) localizes, as a rule, in the limbs and extremities, and (3) occurs when other lesions, organic and glandular, are either absent or present, but more often in their absence, and in the relative proportion of about 2:1.

#### CHARACTER OF LESIONS FOUND

The lesions thus studied have all been subcutaneous and may be dissected away from the skin proper. Occasionally a sinus connected with the surface but this was rather the exception than the rule. Nodules were frequently found in groups and sometimes from two to six were present in an affected area. These nodules were definitely separated from one another or might be loosely attached by bands of fibrous tissue. They varied in size from a hazel nut to that of a large hen's egg. There seemed to be no tendency for the disease to migrate by way of the lymphatic system and the adjacent lymph-nodes were never diseased. Each lesion was made up of a distinct and often thick yellow fibrous wall enclosing contents of varying character. Sometimes the contents were purulent, that is, they were made up of a thick tenacious odorless pus. Pus-forming organisms

are invariably present in this type of lesion and usually the acid-fast organisms are easily found in scrapings from the fibrous wall. The second type of lesion is one in which the contents resemble peanut butter. If a smear is made, the surface when dried has the appearance of a fine sandpaper. This is undoubtedly due to fine lime salts being present. This is the most common type of lesion found and it is usually extremely difficult to demonstrate the presence of acid-fast organisms.

The third type of lesion is one the fibrous wall of which encloses very coarse granular lime salts. I believe these are the oldest type of lesion encountered, and it is usually very difficult to find acid-fast organisms in them.

#### ACID-FAST ORGANISMS AND SUBCUTANEOUS TUBERCULOSIS

The acid-fast organisms found were presumed to be the cause of the disease. These presented even in the same lesion several different forms, the most common being a cocco-bacillus, usually occurring in pairs. Long forms were frequently present and, in many instances, had enlarged ends. Occasionally in the body of the bacillus an area would decolorize and take the counter stain. Round acid-fast bodies were often found, and frequently in association with spherical bodies which took the blue stain but appeared much darker than other material in the smear. It was at first thought that these bodies were spores of different kinds but as many of the specimens were sterile this explanation did not seem to be satisfactory. It was not until after reading Sweany's<sup>12</sup> description of granules of the tubercle bacillus and studying his color plates that these bodies assumed significance. Non-acid-fast organisms of innumerable kinds were found, although frequently lesions would contain no organism save the acid-fast bacillus.

Some authors have stated that subcutaneous lesions are not caused by the tubercle bacillus because they have not succeeded in infecting laboratory animals or in making isolation from the lesions. This view appears unsound, especially when we take into consideration the fact that acid-fast organisms in human tuberculides are altered in virulence for laboratory animals. It is possible that the bovine host under similar circumstances may alter the character of the organism to an even more marked degree. It seemed very probable that the acid-fast organisms in the lesions were the cause of the animals' sensitiveness to tuberculin, whether they were true tubercle bacilli or not.

Taking for granted that the acid-fast bacteria present were the cause of the lesions, the following hypotheses were laid down. *Subcutaneous lesions* are caused by:

- (a) A strain of tubercle bacilli that had become altered in pathogenicity through its residence in the skin.
- (b) A strain of tubercle bacilli not conforming to any known type.
- (c) An organism separate and distinct from tubercle bacilli but capable of exciting sensitiveness to tuberculin.

Factors, such as those pointed out by Watson,<sup>13</sup> that are common to all tuberculous infections—such as symbiosis, individual immunity and varying reactions of an animal to infection—doubtless enter the problem. But even these, conceivably, would not cancel the three hypotheses just mentioned. It was therefore clear that little progress could be made in studying this condition until an organism was isolated directly from subcutaneous lesions. To this end varying methods of cultivation were used in the hope that if the organism were other than a true tubercle bacillus we might discover some method of growing it. It was also considered possible (providing the infection was a true tuberculous one) that although many lesions might contain organisms which were attenuated or even dead, some lesions might harbor more pathogenic organisms and ones that might perhaps infect laboratory animals.

#### ATTEMPTS TO CULTIVATE ACID-FAST ORGANISMS DIRECT FROM TISSUE

Parts of subcutaneous lesions were prepared in three different ways for planting proper, that is, parts of lesions were dissected out under aseptic conditions and ground up finely with broken glass. Plants were made from the material prepared in this manner. Secondly, parts of lesions were simply teased out and smeared over the surface of the media. Thirdly, parts of the lesion were finely ground up and treated for 20 minutes with 15 per cent solution of antiformin. The tubes were all subjected to a temperature of 37° C., some being incubated aerobically, some anaerobically, and some under reduced oxygen tension. It was thought that by the above preparation of tissues and their submission to different conditions with regard to oxygen that all the reasonable factors covering this part of cultivation would be taken into account:

Several different kinds of media were employed: blood agar, glycerin agar, coagulated bovine serum, Dorset's egg medium with and without the addition of blood, digested egg with and without the addition of blood, M'Fadyean's medium for the cultivation of Johne's organism, and also three different media (1, 2 and 3\*) which we designed hoping to supply the substances which might be needed for the cultivation of the bacillus in question. The inoculated tubes were not discarded until a period of nine months had elapsed from the date of planting them. Many different varieties of microorganisms were grown from the seedings made but none which retained the acid-fast stain. Two organisms were fairly consistently found. These were tested for pathogenicity but proved avirulent for laboratory animals. Not a single colony of acid-fast organisms came up from the numerous plants made.

#### ATTEMPTS TO TRANSMIT INFECTION TO CALF BY MEANS OF SUBCUTANEOUS LESIONS

A calf (131), female, three months old, was secured for experiment. It was tested with tuberculin and gave a negative reaction. On April 1, 1927, the right fore leg was shaved and scarified, and ground-up lesion 8668 was applied to the damaged skin, with a compressor bandage. Into the left hind leg macerated lesion 8668 was injected subcutaneously. For a few days there was slight swelling at the point of subcutaneous inoculation, but in ten days this had disappeared. The animal since has shown no evidence of infection. On April 28, a cow (K83144) that had well-defined skin lesions on the fetlock, also on the shoulder, was purchased. One-half the lesion was dissected aseptically from the shoulder, the other half being left in the hope that the disturbance would result in the formation of new lesion which might be used for cultivation while quite young.

The half dissected out was immediately divided into two parts. An incision was made in the left front leg of calf 121 and the lesion slipped beneath the skin, the incision being closed

*\*Medium No. 1:*

Eggs are blown into a sterile flask and broken up with beads, strained through sterile cheesecloth into a petri dish, heated at 73° C. for 3 hours the first day and 1 hour for the next two consecutive days. Small pieces of sterile muscle are then placed here and there over the coagulated egg. After inoculation with the suspected material, the plate is dampened with a 1% solution of trypsin.

*Medium No. 2:*

Liquid egg, as above prepared, 80%; sterile serum 10%; T. B. extract 10% (20% glycerin). Inspissated as No. 1.

*Medium No. 3:*

Liquid egg 70%; extract of T. B. 10%; sterile serum 10%; digested meat extract 10%. Inspissated as No. 1.

The digested meat extract is made by alkalising sterile meat and adding 1% trypsin extract. Digested at 37° C. for 6 days.

with suture and bandaged. The other half was used for planting different media. Acid-fast organisms were found in this lesion. Calf 121 had a swelling at point of inoculation for two weeks, which gradually disappeared and to date has shown no evidence of infection. The removal of half of the lesion from cow K83144 had the opposite result from that hoped for, that is, instead of developing new lesions from the half left *in situ*, the portion left quickly disappeared and no evidence of re-infection has been noted.

#### ATTEMPTS TO INFECT LABORATORY ANIMALS

Guinea pigs and rabbits were inoculated and, in nine cases, chickens also were inoculated. Inoculations were made intraperitoneally and subcutaneously and in some cases the material in question was rubbed into the scarified skin. Attempts also were made to influence the resistance of the animal. For example:

(1) Animals were injected subcutaneously with dead tubercle bacilli. The resultant local abscesses were evacuated and into the cavities was placed a portion of the lesion under investigation.

(2) Animals were subjected to extreme cold as a possible means of lowering their resistance.

(3) Contagious abortion bacilli, and several varieties of organisms isolated from subcutaneous lesions were injected, followed by inoculation with material from the lesions in question. It was thought that perhaps some symbiotic relationship was necessary for the growth of the acid-fast organisms.

After many failures a rabbit (667) was successfully infected from lesion 8572 (see table). The guinea pig, which was inoculated at the same time, unfortunately died from pneumonia. The rabbit was inoculated intraperitoneally and died in 131 days.

#### POSTMORTEM OF RABBIT 667

The body generally was in a well-nourished condition. The lungs were a mass of small tubercles about the size of a pea. The liver presented a few very minute tubercles. The serous portion of the intestines in local areas was studded with a great many small tubercles. The serous surface of the body of the uterus and the horns was studded with small tubercles.

Tubercles were present in the cortex of the kidneys. Only one small gland showed any evidence of tubercle infection.

The strain was carried in laboratory animals and table II will give the information at a glance.

#### ISOLATION OF STRAIN

We did not succeed in isolating it from rabbit 667, but from guinea pig 723 we succeeded with difficulty in isolating it from the spleen, on egg media.

#### CHARACTER OF ORGANISM

The organism was found exceedingly difficult to grow. Even after four generations it still comes up on egg as very minute colonies, and so far we have been unable to obtain a growth on any other medium. These bacilli are acid-fast, and occur as very fine, small bacilli or frequently as cocco-bacilli. The animals infected with this organism react to bovine tuberculin (but not to avian) so it would seem that the bacillus is probably a bovine organism.

#### HISTORY OF HERD 8572

As this is of more than ordinary interest the full history of herd 8572 is given below.

Aug.	1922—tested—one reactor
Sept.	1923—tested—no reactors
Oct.	1924—tested—no reactors
Dec.	1925—tested—no reactors
Oct.	1926—tested—no reactors
Feb.	1927—tested—two reactors
April	1927—tested—no reactors

The two reactors in February, 1927, were both skin-lesion cases, and are referred to on the chart as 8572 and 8573.\*

After approximately 100 attempts to infect guinea pigs and rabbits by the inoculation of material from subcutaneous lesions taken from 33 cattle had failed, rabbit 667 died of tuberculosis on the 131st day after inoculation. This and subsequent animal passages are shown in table II.

#### EXPERIMENTS UPON CALVES

1. Attempted infection by ingestion of tuberculous tissue of guinea pig 722 and rabbit 724 (second animal passage).

*Calf 131:* A young calf was procured for experiment. It was tested with bovine and avian tuberculins and gave a nega-

\*In addition to this case, recently, a guinea pig was successfully infected from 8895; it died in 170 days with generalized tuberculosis. This strain to date has not been isolated and will not be further discussed in this report.

tive reaction. August 18, 1927, it was fed in milk 1 cc of pus which had been drawn from subcutaneous lesion of guinea pig 722. On August 26, 1927, it was again fed tuberculous material, this time a piece of ground-up lesion from rabbit 724. The animal continued to look healthy and remains in good condition to date. On October 6 it was given a dose of bovine tuberculin in the caudal fold and avian tuberculin in the perineal region. The animal gave a pronounced reaction (P5) to bovine tuberculin but did not react to avian. To see if a local inflammation would favor the development of subcutaneous lesions, an artificial injury was produced on one of the legs. Under aseptic conditions an incision was made and a sterile glass bead introduced beneath the skin. The wound was closed by suture. To date no lesion has occurred. The animal is being kept under close observation.

2. Attempted infection by subcutaneous inoculation of skin-lesion culture 8572 (second generation).

*Calf 132:* Tested with bovine and avian tuberculins, gave negative reactions.

A culture of tubercle bacilli, subcutaneous strain 8572, second generation, grown upon egg medium for 15 days, was washed off with 10 cc of normal broth. On September 8, 1927, 1 cc was injected into the skin of the left fore leg in the region of the metacarpal bone. For several days no evidence of infection was found but in about three weeks appeared a small hard swelling which has persisted since and now has the appearance of a skin lesion. October 8, 1927, the animal gave a well-marked reaction (P4) to bovine, but did not react to avian tuberculin.

One particular point will be noted from a study of lesions as indicated on the inoculation chart: the general tendency of the organism to colonize in the subcutaneous tissue of the rabbit, in addition to the internal organs, as takes place with a strain of the usual bovine type.

The work with cattle has not progressed far enough to make any deductions except that subcutaneous lesions may be produced by injecting the organism in pure culture beneath the skin.

#### DISCUSSION

I believe it has been the observation of those familiar with the tuberculin reaction obtained in animals suffering from subcutaneous tuberculosis, that on the whole they do not react as markedly as animals suffering from other forms of tuberculosis. In so far as we are at present able to tabulate these cases, about

TABLE I—Data on cases of subcutaneous tuberculosis.

ANIMAL	SEX	AGE (Yrs.)	INTRA- DERMAL TUBER- CULIN REACTION	SUBCUTANEOUS LESIONS		OTHER LESIONS	CATTLE ON PREM- ISES	REACTORS	ANIMALS DESTROYED	LESIONS IN OTHER REACTORS IN SAME HERD
				LOCATION	ACID- FAST ORGAN- ISMS					
7012	F	7	P	Rt. hind leg	Yes	None	25	1	1	No visible lesion.
7013	F	8	P	Rt. hind leg	Yes	Bronchial	18	1	1	
7014	F	9	P	Left hind leg	Yes	None	15	2	2	
7015	F	10	P	Rt. hind leg	Yes	None	8	1	1	
7160	F	4	P	Rt. fore leg	None	Lungs; bronchial, mediastinal and retropharyngeal	29	5	5	
7261	F	12	P	Sternum	None	Lungs, pleura and mediastinal	31	4	4	1. No visible lesion. 2. Bronchial and mediastinal. 3. Pharyngeal and mesenteric. 4. Bronchial and mediastinal.
8188	M	2	P	Femoral	Yes	None	36	1	1	1. Lungs, pleura. 2. Bronchial. 3. No visible lesion.
8200	F	8	P	Metacarpal	None	None	22	1	1	
8367	F	4	P	Metacarpal	Yes	Bronchial and prescapular	57	4	4	
8442	F	6	P	Tibial	Yes	Bronchial, retropharyngeal	40	8	8	1. Retropharyngeal. 2. Lungs. 3. Bronchial and precutural. 4. Mediastinal and retropharyngeal.
8443	F	6	P	Thigh	Yes	Bronchial, mediastinal	40	8	8	2. Lungs. 3. Lungs. 4. Lungs. 5. Lungs, bronchial and mesenteric. 6. Lungs, bronchial and mesenteric.
8445	F	2	P	Metacarpal	None	None	36	2	2	1. Lungs.



TABLE IA—*Analysis and summary of table I.*

HERDS TESTED	ANI- MALS TESTED	RE- ACTORS	SUBCU- TANEOUS LESIONS ONLY	SUBCUTANEOUS LESIONS PLUS OTHER LESIONS	LESIONS OTHER THAN SUBCUTANEOUS	NO VISIBLE LESION
29	798	67	23	10	26	8
		8.4%	2.9%	1.2%	3.2%	1.0%
			4.1%			

70 per cent react less severely to tuberculin than animals in the same herd affected with other tuberculous lesions. In fact for a time I was inclined to believe these subcutaneous lesions were not tuberculous but were caused by a closely related organism and that the reaction was in the nature of a group reaction and consequently less marked. The initial failures to infect laboratory animals or to cultivate the acid-fast organisms from the infected tissue seemed to support this view. I am not prepared to accept this interpretation now, but look upon the lesions as truly tuberculous, although possibly caused by a strain somewhat atypical in its selection of unusual tissue for colonization. It will be noted that laboratory animals were infected from but two out of thirty-three (6.06 per cent) natural clinical cases of subcutaneous tuberculosis, and these were both from young animals. I believe there is more than coincidence in this. A possible explanation is that the lesions were young and the organisms had not been harbored long enough to become attenuated. When lesions become older the organisms are probably attenuated or dead. The result is that they do not infect laboratory animals and are unable to grow on culture media, although the animal harboring the lesions which they have caused is still sensitive to tuberculin in varying degrees. At the same time it must be kept in view that no two animals are likely to influence a strain in an exactly similar manner, as examples, animals 8572 and 8573. The lesions on these animals occurred in precisely the same location and appeared in a similar stage of development, the animals were the same age and the source of infection was doubtless the same, but one lesion infected laboratory animals while the other did not. This would seem to be due to a difference in the mechanism of defense in the two animals and its effects upon the organism rather than to any marked difference in the age of the lesions.

TABLE II—*Subcutaneous lesion 8572—Inoculation experiments on laboratory animals*

ANIMAL PASSAGE	ANIMAL		ROUTE	DEATH (DAYS)	INOCULUM	LESIONS
	NO.	SPECIES				
1st	666	G.P.	Intrap.	18	8572 Subcut. lesion of cow	Pneumonia Lungs, spleen, liver, intestines and uterus
	667	Rabbit		131		
2nd	721	Rabbit	Subcut.	55	Lung of rabbit 667	Lungs, kidneys, spleen (slight). Subcutaneous lesion at point of inoculation. No lymph- glands affected.
	722	G.P.	Subcut. (Rt. groin)	56		Lungs, liver, spleen and sub- cutaneous right shoulder
	723	G.P.	Intrap.	21		Lungs, liver, spleen and lum- bar glands
	724	Rabbit	Intrap.	51		Lungs, kidneys, intestines, peritoneum, pancreas and two subcutaneous lesions
3rd	741	Rabbit	Intrap.	93	Pus from guinea pig 722	Subcutaneous right abdomen, lungs and kidneys
	743	Rabbit	Oral	28		Small lesions on cecum
	744	Rabbit	Oral	15		No lesions found
	745	Rabbit	Subcut.	11		Sepsis
	746	Rabbit	Subcut.	10		Sepsis
	747	Rabbit	Subcut.	75	Culture from spleen of guinea pig 723	Subcutaneous lesion on leg, lungs and kidneys
	748	Rabbit	Subcut.	69		Subcutaneous lesion on leg, lungs and kidneys
	749	Rabbit	Oral	K.105		Subcutaneous and also skin in the lumbar region, lungs, kid- neys and intestines
	750	Rabbit	Oral	K.106	Culture from spleen of guinea pig 722	Lungs, kidneys and intestines
	759	G.P.	Subcut.	74	Lung of rabbit 721	Local glands, liver, spleen and lungs
	760	G.P.	Intrap.	25		Liver, spleen, lungs and bron- chial gland
	761	G.P.	Subcut.	7		Pneumonia
	762	G.P.	Intrap.	5		Hemorrhage in peritoneal cavity
	7229	Chicken	Intrap.	K. 50		No lesions found
4th	756	Rabbit	Intrav.	21	Lung of rabbit 724	Lungs infiltrated. Miliary tubercles in spleen
	780	G.P.	Intrap.	17	Pus from rabbit 747	Skin moderately affected
	751	Rabbit (Contro	Oral Inocul	K.153 ation)	Laboratory strain of bo- vine tubercle bacillus 100 (for compar- ison and control)	Lungs, kidneys and intestines

The route by which animals are infected is of much interest and importance. That animals may be infected through the skin by punctured wounds is without doubt true, in fact, experiments with calf 132 demonstrates this. In the case of badly infected herds, such as cow 7160, there seems very good reason for believing that animals may be infected through constant contact with excreta laden with tubercle bacilli, and which possibly gain entrance to the subcutaneous tissues by punctured wounds made by sharp instruments, or by fissures which may be produced in the skin. That this is the only means of infection seems improbable. From a study of the epizootology of the disease, as illustrated by such examples as cases 8572 and 8573 (these are representative of many of our cases), it will be noted that the animals affected were never, so far as known, in contact with known tuberculous cattle. Since these animals were taken out the herd has been free from reactors. We may therefore presume, so far as these cattle are concerned, that they were not standing in excreta harboring tubercle bacilli. Had an open-case-ceased-reactor been present, other cases of tuberculosis would have subsequently occurred. The history shows that this has not taken place. There is a possibility which might be mentioned, that is, if an animal may harbor tubercle organisms of altered virulence without the production of lesions or sensitiveness to tuberculin and disseminate these organisms, it would perhaps explain the source of bacilli for excretal contamination and therefore subcutaneous inoculation.

We must not forget that animals other than cattle are usually present on the premises. These may harbor organisms and be sources of infection. It is difficult to believe, however, that sufficient organisms would be excreted to supply material for intracutaneous infection without at the same time infecting animals in the usual manner unless the strain in question had a predilection for the subcutaneous tissues. To sum up, while subcutaneous-lesion cases are doubtless caused by infection through the skin with material harboring the tubercle bacillus, other cases have been found in which this explanation is not satisfactory and it would seem that the explanation of these cases is that the organism in question has a tendency to colonize in the subcutaneous tissue irrespective of the avenue of infection.

## ACKNOWLEDGMENTS

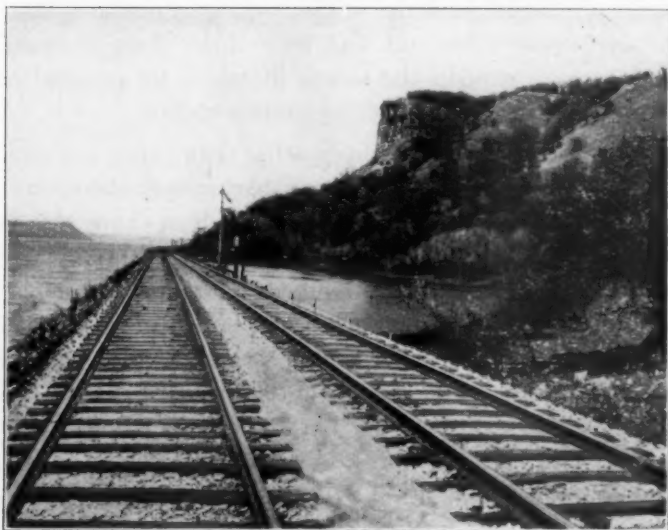
I wish to acknowledge my indebtedness to Dr. E. A. Watson, Chief Pathologist, for helpful advice and criticism, and to Dr. R. C. Duthie for assistance in the preparation of this paper.

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The Burlington Railroad from Chicago to St. Paul and Minneapolis runs alongside the upper Mississippi River.

## PRELIMINARY REPORT OF MORE THAN A YEAR'S WORK WITH BOTULINUS ANATOXIN

By C. E. SALSBERY AND G. E. JACOBI

*Kansas City, Mo.*

After more than a year of continuous work with botulinus anatoxin, during which time we have collected a large amount of data, we are pleased to offer this condensed report of some of the work accomplished. The amount of space placed at our disposal in this issue of the JOURNAL forces us to curtail this report of the results of the work very much.

During the four or five years just past, so much investigational work has been done with anatoxins in general and so much accomplished in an experimental way, that the subject is rapidly gaining world-wide interest. A review of this work shows that it is of more than passing interest, because in human medicine it has been applied in a practical way, especially in Canada, where anatoxins have been used in a great many cases to immunize people, mostly children, against diphtheria.

The anatoxins in tetanus, diphtheria and botulism have proven to be very effective immunizing agents and while the work has been mostly of an experimental nature, yet it appears to be an accomplished fact. So far as botulism is concerned, we feel that the matter of dosage for use in the field is the only phase of the subject that still requires further investigation. Our work at this time is being directed with that object in mind. We have, beyond doubt, established the fact that animals may be successfully immunized experimentally, after having used a large number of guinea pigs, rabbits, chickens, cattle and horses.

The details of this work must be left for another paper. A complete report to date would require much more space than is immediately available. The accompanying tables without explanation, show only a part of the testing program. We are including only those that require no comment. The completed report which we hope to publish later will include numerous other experimental tests with variations that will be fully discussed. We might add that the tables covering the early work are not included, since they are considered more in the light of "range-finders." They will all be published later.

We have felt that this preliminary report would be of much more interest, having little reading matter and more of the actual results in the form of test-charts.

TABLE I—*Type C anatoxin in guinea pigs*

G. P.	INJECTION OF ANATOXIN		INJECTION OF TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D.	
1	8-17-27	1.0	8-31-27	1500	Lived
3	Control		8-31-27	1500	D. 23 hours
2	8-19-27	5.0	8-31-27	7500	Lived
4	Control		8-31-27	7500	D. 21 hours

M. L. D. of unmodified toxin—0.0001 cc.

TABLE II—*Type C anatoxin in guinea pigs*

G. P.	INJECTION OF ANATOXIN		INJECTION OF TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D.	
5	8-22-27	1.0	9-8-27	1500	Lived
6		1.0		1500	Lived
7		1.0		1500	D. 91 hours
8	Control		9-8-27	1500	D. 25 hours

M. L. D. of unmodified toxin—0.0001 cc.

TABLE III—*Type B anatoxin in guinea pigs*

G. P.	INJECTION OF ANATOXIN		INJECTION OF TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D.	
3	11-2-27	1.0	11-18-27	2800	Remained well
7		1.0		2800	Remained well
10		1.0		2800	Remained well
18		1.0		2800	Remained well
20		1.0		2800	D. less than 24 hours
24	Controls			2800	D. less than 24 hours
25				2800	D. less than 24 hours

M. L. D. of unmodified toxin—0.0000357 cc.

TABLE IV—*Type B anatoxin in guinea pigs with increasing doses of toxin*

INJECTION OF ANATOXIN			EXPOSURE TO TOXIN		
G. P.	DATE	DOSE (cc)	DATE	M.L.D.	RESULTS
15	8-22-27	1.0	9-8-27	500	Remained well
16		5.0		500	Remained well
10	Control			500	D. 23 hours
24	8-22-27	1.0		1250	Remained well
18		5.0		1250	Remained well
20	Control			1250	D. 18 hours
25	8-22-27	1.0		2500	Remained well
19		5.0		2500	Remained well
22	Control			2500	D. 16 hours

M. L. D. of unmodified toxin for guinea pigs—0.0002 cc.

TABLE V—*Type C anatoxin in rabbits*

RABBIT	INJECTION OF ANATOXIN		EXPOSURE TO TOXIN		RESULTS
	DATE	DOSE (CC)	DATE	M.L.D. (G. P.) *	
5	11-5-27	1.0	11-18-27	5000	Remained well
6		1.0		5000	Remained well
9		1.0		5000	Remained well
11		1.0		5000	Remained well
21		1.0		5000	Remained well
24		1.0		5000	Remained well
10	Controls			5000	D. less than 24 hours
17				5000	D. less than 24 hours

\*M. L. D. of unmodified toxin for guinea pigs—0.0002 cc.

TABLE VI—*Type C anatoxin in rabbits*

RABBIT	INJECTION OF ANATOXIN		INJECTION OF TOXIN		RESULTS
	DATE	DOSE (CC)	DATE	M.L.D. (G. P.)*	
1	8-24-27	2.0	9-8-27	15000	Lived
2		2.0		15000	Lived
3		2.0		15000	Lived
4		5.0		15000	Lived
5		5.0		15000	Lived
6		5.0		15000	Lived
7	Controls			15000	D. 28 hours
8				15000	D. 29 hours

\*M. L. D. of unmodified toxin for guinea pigs—0.0001 cc.

TABLE VII—Horse immunized with polyvalent anatoxin A, B and C, later exposed at intervals to toxins A, B and C

HORSE	INJECTION OF ANATOXIN			EXPOSED TO TOXIN			RESULTS
	DATE	DOSE (cc)	TYPE	DATE	G.P. M.L.D.	TYPE	
140	10-19-27	12.5	A				
		2.7	B				
		15.0	C				
	11-18-27	12.5	A				
		2.7	B				
		15.0	C				
146 4 45	Control on B Control on A Control on C			11-28-27	7000	B	Remained well
				12-14-27	12000	A	Remained well
				12-22-27	50000	C	Remained well

M. L. D. of unmodified toxin type A for guinea pigs—0.000166 cc.

M. L. D. of unmodified toxin type B for guinea pigs—0.0000357 cc.

M. L. D. of unmodified toxin type C for guinea pigs—0.0002 cc.

TABLE VIII—Type B anatoxin in calves

CALF	INJECTION OF ANATOXIN		EXPOSURE TO TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D. (G. P.)*	
13	9-29-27	2.5	10-15-27	70000	Remained well
14		2.5		70000	Remained well
124	Control			70000	D. 100 hours

\*M. L. D. of unmodified toxin for guinea pigs—0.0000357 cc.

TABLE IX—Vaccinating a calf at different intervals with botulinus anatoxins A, B and C

CALF	INJECTION OF ANATOXIN			EXPOSED TO TOXIN			RESULTS
	DATE	DOSE (cc)	TYPE	DATE	M.L.D. (G. P.)	TYPE	
11 12	8-24-27	15.0 Control	B	9-10-27	70000 70000	B*	Remained well D. 76 hours
11 125	9-29-27	10.0 Control§	C	10-15-27	150000 150000	C†	Remained well Chronic botulism
11 13	11-7-27	12.5 Control	A	11-23-27	120000 120000	A‡	Remained well D. 80 hours

\*M. L. D. of unmodified toxin for guinea pigs—0.0002 cc.

†M. L. D. of unmodified toxin for guinea pigs—0.0001 cc.

‡M. L. D. of unmodified toxin for guinea pigs—0.000166 cc.

§Ninety-six hours after exposure to "C" toxin, the control did not appear to be very sick, so another dose of 75,000 M. L. D. was given to both calves, 10-19-27. 10-20-27 control was down, unable to rise, showing marked paralysis and remained so for 15 days before being destroyed (chronic form). The vaccinated calf remained well.

TABLE X—*Calves vaccinated and exposed to A and B botulinus toxins*

	INJECTION OF ANATOXIN			EXPOSED TO TOXIN			
CALF	DATE	DOSE (CC)	TYPE	DATE	M.L.D. (G. P.)	TYPE	RESULTS
205	5-28-28	14.0	A	6-19-28	90000	A	Remained well
		1.7	B		50000	B	
206		14.0	A		90000	A	Remained well
		1.7	B		50000	B	
207		14.0	A		90000	A	Remained well
		1.7	B		50000	B	
208		14.0	A		90000	A	D. 88 hours
		1.7	B		50000	B	
209		14.0	A		90000	A	Remained well
		1.7	B		50000	B	
210		14.0	A		90000	A	K. 6-30-28. Complete paralysis
		1.7	B		50000	B	
283	Control—Type A				90000	A	D. 76 hours
284	Control—Type B				50000	B	D. less than 65 hrs.
285	Control—Types A and B				90000	A	D. less than 65 hrs.
					50000	B	
286	Control—Types A and B				90000	A	D. 70 hours
					50000	B	

M. L. D. of un modified Type A toxin for guinea pigs—0.000166 cc.

M. L. D. of un modified Type B toxin for guinea pigs—0.00002 cc.

TABLE XI—*Chickens on botulinus anatoxin Type "C"*

BIRD	INJECTION OF ANATOXIN		INJECTION OF TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D. (G. P.)	
6	10-19-27	1.0	11-4-27	15000	Remained well
7		1.0		15000	Remained well
8		1.0		15000	Remained well
9		1.0		15000	Remained well
10		1.0		15000	Remained well
1574	Controls			15000	D. Botulism
38				15000	D. Botulism

M. L. D. of unmodified toxin—0.0002 cc.

TABLE XII—*Chickens vaccinated with anatoxin and exposed to botulinus A toxin*

BIRD	INJECTION OF ANATOXIN		EXPOSED TO TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D. (G. P.)	
407	12-10-27	2.0	1-12-28	300	Lived
408		2.0		300	Lived
411		2.0		300	Lived
413		2.0		300	Lived
415		2.0		300	Lived
416		2.0		300	Lived
417		2.0		300	Lived
418		2.0		300	Lived
419		2.0		300	Lived
420		2.0		300	Lived
421		2.0		300	Lived
423		2.0		300	Lived
424		2.0		300	Lived
427		2.0		300	Died
462		2.0		300	Lived
59	Controls			300	D. 72 hours
60				300	D. 72 hours
61				300	D. 96 hours

M. L. D. of unmodified toxin for guinea pigs—0.0002 cc.

TABLE XIII—*Chickens vaccinated and exposed to type A botulinus toxin*

BIRD	INJECTION OF ANATOXIN		EXPOSED TO TOXIN		RESULTS
	DATE	DOSE (cc)	DATE	M.L.D. (G. P.)	
62	11-17-27	2.0	1-12-28	300	Lived
63		2.0		300	Lived
64		2.0		300	Lived
65		2.0		300	Died
66		2.0		300	Lived
67		2.0		300	Lived
68		2.0		300	Lived
69		2.0		300	Lived
70		2.0		300	Lived
71		2.0		300	Lived
72		2.0		300	Lived
73		2.0		300	Lived
74		2.0		300	Lived
75		2.0		300	Lived
76		2.0		300	Lived
59	Controls*			300	D. 72 hours
60				300	D. 72 hours
61				300	D. 96 hours

M. L. D. of unmodified toxin for guinea pigs—0.0002 cc.

\*These chickens were exposed at same time as those in table XI, hence, the same controls apply to both tests.

## CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

### ENCEPHALITIS IN CALVES\*

By FRANK P. MATHEWS, *Lafayette, Ind.*

*Department of Veterinary Science, Purdue University Agricultural Experiment Station*

One hundred head of short-yearling, Hereford calves were shipped from Texas and placed in the feed-lot about December 1,

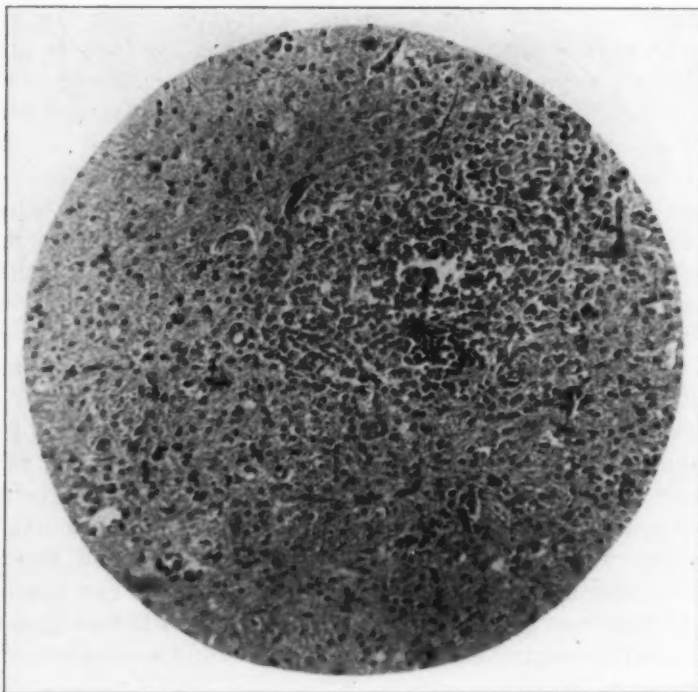


FIG. 1. Photomicrograph of section of medulla, showing a degenerated area filled with large mononuclear leucocytes. The leucocytes show a remarkable vacuolation of the cytoplasm.

1927. Ten head died of so-called shipping fever within three weeks from the date of arrival. The shipping fever subsided by

\*These cases were brought to the attention of the writer by Dr. J. T. Redmon, of Covington, Ind.

the end of the third week, and for 25 days the calves were apparently in good condition. At this time (46 days after arrival) one calf went "off feed" and four similar cases developed during the next week. A second lot of Aberdeen Angus calves were maintained upon the same farm but in a feed-lot which was separated from the first lot by about a half-mile. No losses occurred in the second lot although part of the Angus calves had been shipped from Texas along with the Hereford calves. Each feed-lot was equipped with its own silo, from which ensilage was obtained. Otherwise, the rations for each lot were the same. The ensilage which was being fed to the Herefords was quite moldy, and for this reason about 75 pounds were carefully selected for the presence of mold and fed to a horse but with negative results.

*Symptoms:* The five cases that developed during the sixth and seventh weeks after they were placed in the feed-lot manifested symptoms which commonly lead to a diagnosis of "forage poisoning." The affected animals first refused food and water and separated themselves from the rest of the herd. They wandered aimlessly about the feed-lot and at irregular intervals would stand with their heads lowered and pushed against the fence or the side of the barn. Deglutition was evidently impaired, as their mouths were partly filled with masticated roughage. Decubitus developed within three to seven days after the onset of the first symptoms and was followed by coma and a fatal termination in from two to three days. One animal manifested a palsic shaking of the head for some time before death.

*Postmortem examination:* The autopsy findings were of little diagnostic importance. There was a mild pharyngitis which might have been produced by the passage of the stomach-tube. The mucosa of the small intestines and abomasum showed a marked congestion. Otherwise the abdominal and thoracic organs were negative. The central nervous system also appeared to be free from gross lesions. A complete set of tissues from one case and the central nervous system of a second were obtained for microscopic study.

*Microscopic examination:* The mucosa and submucosa of the pharynx, abomasum and small intestines showed a marked congestion. Large numbers of polymorphonuclear leucocytes, and much phagocytized hemosiderin were found in some of the mesenteric lymph-glands. There was an albuminous degeneration of the kidneys. With these exceptions, the abdominal and thoracic organs were free from pathological changes. The cerebrum,

cerebellum and spinal cord were essentially negative. In the medulla there was a perivascular round-cell infiltration, which consisted of lymphoid and large mononuclear leucocytes. Many of the nerve tracts in the medulla showed degenerated areas which were accompanied by a pronounced cellular reaction. The cellular reaction in the early lesions consisted principally of large mononuclear leucocytes, but in the more advanced lesions polymorphonuclear leucocytes were quite numerous. The cyto-

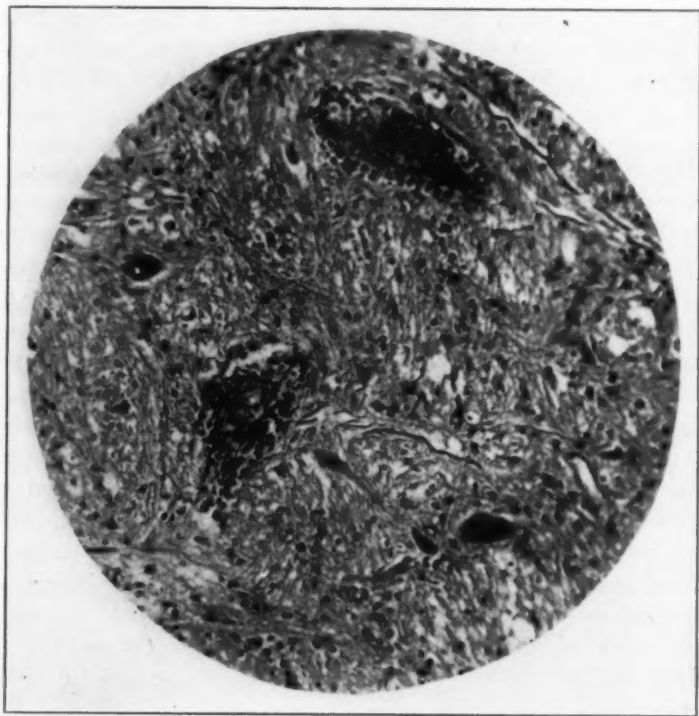


FIG. 2. Photomicrograph of a section from the medulla, showing a perivascular round-cell infiltration.

plasm of most of the mononuclear leucocytes showed a remarkable vacuolation. The ganglion cells adjacent to the degenerated areas were also involved in the retrograde process.

*Diagnosis:* The microscopic findings are similar to the changes found in other nervous diseases, which are known to be of infectious origin. Since in some cases these diseases are known to have long incubation periods, it is probable that the calves in this case were infected before entering the feed-lot. The moldy

ensilage was evidently incidental. In some respects these cases resemble the bulbar paralysis of Hutyra and Marek, but the clinical and pathological manifestations suggest encephalitis associated with lethargic symptoms as the most appropriate diagnosis.

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**POSSIBLY HYPOGLYCEMIA\***

*By O. N. SCHULTZ, Latimer, Iowa*

The subject was a high-producing Jersey cow; the condition developed following her sixth calving and her third successive attack of parturient paresis. Recumbency and almost complete coma developed twelve hours after calving. The cow was found in this condition at 2:00 a. m., December 7. The udder was inflated and  $\frac{3}{8}$  grain of strychnin sulphate was injected subcutaneously. As the quarters in which she was confined were very cold (about 10 degrees below zero) and a blizzard raging outside, several jugs filled with warm water were placed about the body and the animal heavily blanketed. The case was seen again at 9:00 a. m., at which time she was on her feet but presented a drowsy appearance and her gait was uncertain. However, no treatment was given at this time. At 3:00 p. m. the animal was down again and in about the same condition as when first seen. The udder was again inflated and  $\frac{1}{2}$  grain of strychnin injected subcutaneously. As the animal had not had a bowel movement, the rectum was emptied (largely for the owner's benefit).

At 9:00 p. m., the cow was reported to be on her feet. She was dull and moved with difficulty. At 2:30 a. m. the next morning, I was informed that the cow was again unable to rise. I decided that something else than inflation of the udder was required and that the glucose treatment would be tried. However, this was not done until 8:00 a. m. The usual recommended dosage of glucose was injected into the jugular vein, the udder re-inflated,  $\frac{1}{2}$  grain of strychnin injected subcutaneously and the animal catheterized at this time. At 2:00 p. m., the cow

\*Presented at the fortieth annual meeting of the Iowa Veterinary Medical Association, Des Moines, January 17-19, 1928.

was in deeper coma than ever and looked like a hopeless case. However,  $\frac{1}{2}$  grain of strychnin was injected again and as I did not have time for further treatment, I returned two hours later and although the case looked bad there were slight signs of improvement. Double the usual dosage of glucose was injected intravenously, the udder re-inflated and another  $\frac{1}{2}$  grain of strychnin injected subcutaneously.

A hypodermic syringe and a tube of  $\frac{1}{2}$ -grain strychnin tablets were left for the owner to inject every two hours. This was done at 6:00 p. m., but at 8:00 p. m. the owner telephoned me that he could not catch the cow to give the injection and that she was then brighter than at any time since she took sick. The next morning I was informed that the animal would eat and drink and had had a bowel movement. What affected recovery? I personally feel that pushing the strychnin injections was responsible, but maybe the glucose was of value.

I practice in a dairy district and treat a large number of cases of milk fever each year and have never failed, until this case, to affect recovery with the air treatment supplemented with strychnin. (Some have required a second treatment.) I think the latter has merits, because when I have used atropin, camphorated oil, or nothing, response has always been slow. In the Jersey and the Guernsey breeds,  $\frac{1}{2}$  grain of strychnin often causes a super-sensitiveness or even mild spasms, but these are never alarming.

#### ON THE WAY TO MINNEAPOLIS



Corkscrew Bridge—On the Cody Road to Yellowstone Park.

## ABSTRACT

A STUDY OF THE BLACKTONGUE—PREVENTIVE ACTION OF 16 FOODSTUFFS WITH SPECIAL REFERENCE TO THE IDENTITY OF BLACKTONGUE OF DOGS AND PELLAGRA OF MAN. Joseph Goldberger, G. A. Wheeler, R. D. Lillie and L. M. Rogers. U. S. Public Health Reports, xliii (June 8, 1928), 23, pp. 1385-1454.

In a previous publication the authors found that blacktongue of dogs was due to a deficiency in diet and that yeast contained something which was capable of correcting this deficiency. Continuing their work with different foodstuffs, as a source of this blacktongue preventive, the following summary and conclusions were made:

The blacktongue-preventive potency of 16 foodstuffs has been studied and correlated to the pellagra-preventive potency (or lack of it) of those, eleven in number, for which this was known, with the following results:

*Maize*, if it contains any, is a poor source of the preventive for both blacktongue and pellagra.

*Whole wheat* contains the blacktongue preventive, but in small amount.

*Commercial wheat germ* contains, and may be rated as a relatively good source of, the preventive for both blacktongue and pellagra.

The *cowpea* contains, but is a poor source of, the preventive for both blacktongue and pellagra.

The *soy bean*, contains the blacktongue preventive, but in relatively small amount, appreciably more, however, than the cowpea, but considerably less than the extracted wheat germ. So far as it goes, the experience with the soy bean in the human disease is, at least, not inconsistent with that in the experimental disease of the dog.

*Milk* contains the preventive for both the human and the canine disease, but contains it in relatively small amount.

*Butter*, while not devoid of it, is relatively a very poor source of the blacktongue preventive, a conclusion that is in harmony with the experience with butter in pellagra.

*Cod-liver oil* would seem very poor in or lacking the preventive for both blacktongue and pellagra.

*Cottonseed oil* contains little, if any, of the preventive for blacktongue. No specific study of the effectiveness of this oil in pellagra has been made; on the basis of general experience it seems unlikely that this oil contains the pellagra preventive in significant amounts.

*Beef muscle* is a good source of the preventive for both blacktongue and pellagra.

*Pork liver* is a good source of the blacktongue preventive; it has not yet been studied in pellagra.

*Canned salmon* contains the blacktongue preventive. A study of its effectiveness in pellagra is in progress.

*Egg yolk* contains the blacktongue preventive; a specific study of its value in pellagra has not yet been undertaken.

The *canned tomato* contains the preventive for both blacktongue and pellagra, but in relatively small amount.

The *carrot* contains, but is a relatively poor source of, the preventive of blacktongue. Its reported failure in pellagra prevention is consistent with the indications of its feebleness as a blacktongue preventive.

The *rutabaga turnip* contains, but is a relatively poor source of, the blacktongue preventive. Its failure in pellagra prevention is consistent with its poverty in the blacktongue preventive.

So far as they have been studied, the foodstuffs that appear to be good sources of the blacktongue preventive also appear to be good sources of the pellagra preventive; those that appear to be poor sources of, or lacking in, the blacktongue preventive likewise appear to be poor sources of, or lacking in, the pellagra preventive.

Considering the available evidence as a whole, it would seem highly probable, if not certain, that experimental blacktongue and pellagra are essentially identical conditions and thus that the preventive of blacktongue is identical with the pellagra preventive, or factor P-P.

On the basis of the indications afforded by the test in the dog, liver, salmon, and egg yolk are recommended for use in the treatment and prevention of pellagra in the human.

S. S.

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***Minneapolis, the Financial, Wholesaling, Jobbing, Reatling, Manufacturing, Distributing, Educational, Cultural Metropolis of the Northwest***

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## ARMY VETERINARY SERVICE

### CHANGES RELATIVE TO VETERINARY OFFICERS

Major Christian W. Greenlee is relieved from his present assignment as student at the Army Veterinary School, and directed to sail on or about Sept. 5, 1928, for the Philippine Department for duty.

Each of the following named officers is assigned to station indicated after his name, upon completion of his present tour of foreign service in the Philippine Department.

Lt. Colonel Burt English — to Fort Sill, Okla.

Major D. B. Leininger — to Fort Bliss, Tex.

Lt. Col. James R. Shand is relieved from duty at Fort Sill, Okla., and directed to proceed on or about Sept. 28, 1928, for the Philippine Dept. for duty.

Capt. Edward M. Curley is relieved from further assignment at Cornell University, and directed to proceed to Carlisle Barracks, Pa., for temporary duty for a period of approximately four months, and upon completion of this temporary duty to report to Brooklyn, New York, N.Y.G.I.D., for duty.

Capt. Geo. L. Caldwell is relieved from further assignment at the Cavalry School, Fort Riley, Ks., upon completion of his present course of instruction, and will report to the Commandant, Army Veterinary School, Army Medical Center, Washington, D. C. for duty.

Each of the following named officers is assigned to duty at the Army Veterinary School, Washington, D. C., for the purpose of pursuing a course of instruction, being relieved from his present assignment and duties in time to proceed to San Francisco, Calif., to sail on transport scheduled to leave that port on or about August 19, 1928, for New York City:

Captain Fred C. Waters — Camp S. D. Little, Ariz.

Captain Philip H. Riedel — Fort Bliss, Texas.

### Reserve Corps

#### *New Acceptances*

Barthelme, L. F.....	2nd Lt....	1815 Washington Ave., Parson, Ks.
Bruns, Van Leslie.....	2nd Lt....	Lake City, Fla.
Carlisle, Wm. M. C.....	2nd Lt....	Hickory, Pa.
Elliott, C. H.....	2nd Lt....	Yorkville, Ill.
Grace, Reginald L.....	2nd Lt....	Box 267, Norwich, N.Y.
Carroll, F. E.....	2nd Lt....	Fredericktown, Mo.
Dunlap, Glen L.....	2nd Lt....	1126 Bluemont St., Manhattan, Ks.
Ehlers, Daniel P.....	2nd Lt....	3927 So. 24th Street, Omaha, Neb.
Elsea, Robert L.....	2nd Lt....	Sweet Springs, Mo.
Lauts, Albert E.....	2nd Lt....	Spencer, Neb.
McInay, John N.....	2nd Lt....	1126 Bluemont St., Manhattan, Ks.
Newlin, Theo. A.....	2nd Lt....	Lewis, Kansas.
Rose, V. T.....	2nd Lt....	Ionia, Kansas.
Schmidt, Albert I.....	2nd Lt....	37th & Leavenworth Rd., Kansas City, Ks.
Smith, L. H.....	2nd Lt....	Lebo, Kansas.
Shoeman, John D.....	2nd Lt....	Waukee, Iowa.
Spurlock, J. H.....	2nd Lt....	RFD No. 6, Osage City, Ks.
Andrews, Wm.....	2nd Lt....	7 S. 9th St., Marshalltown, Ia.
Collins, Clay R.....	2nd Lt....	Tilden, Nebr.
Criley, Ben R.....	2nd Lt....	Ottumwa, Ia.
Glascok, D. Wm.....	2nd Lt....	Audubon, Iowa.
McNellis, R.....	2nd Lt....	Dunkerton, Iowa.
Mayfield, O. J.....	2nd Lt....	Parnell, Mo.
Hilbert, K. F.....	2nd Lt....	Candor, N. Y.
Hopson, Geo. H.....	2nd Lt....	131 Center St., Massena, N. Y.

Kelly, W. A. . . . . 2nd Lt. . . . . Lysander, N. Y.  
 MacKeller, R. S., Jr. . . . 2nd Lt. . . . 39 Charles St., New York, N. Y.  
 Poley, Philip. . . . . 2nd Lt. . . . 1225 Seneca Ave., Bronx, N. Y.

*Promotions*

Shigley, James Fremont. . 1st Lt. . . 118 S. Sparks St., State College, Pa.  
 Harrison, Richard H., Jr. Capt. . . 806 N. Haskell St., Dallas, Tex.  
 Pyle, Norman J. . . . . Capt. . . . Amherst, Mass.

*Separations*

Scanlan, Wm. J. . . . . 1st Lt. . . . ORC status terminated 2-24-28  
 Bogue, Joseph A. . . . . 2nd Lt. . . . Failed to accept reappointment.  
 Kirkwood, Glenn B. . . . 2nd Lt. . . . Failed to accept reappointment.  
 Sailor, Ernest S. . . . . 2nd Lt. . . . Failed to accept reappointment.  
 Baker, Bennie J. . . . . 2nd Lt. . . . Failed to accept reappointment.  
 Driver, Fred C. . . . . 1st Lt. . . . Declined reappointment 6-4-28  
 Lumby, Charles L. . . . . 2nd Lt. . . . Died 3-9-27  
 Sears, Kirtley. . . . . 1st Lt. . . . ORC status terminated 3-31-28

***Minneapolis, the Land of Hiawatha***

**ANIMALS' HEALTH A HUMAN CONCERN**

The problem of keeping animals healthy is one of great importance to the health and wealth of human beings. It is not merely a question of kindness to animals, though on this account alone it would deserve attention.

Many of the diseases that afflict the animal world are communicable to man. Transmission may take place from contact, or from the use of diseased animals as food.

The individual who is expected to preserve the health of animals and to guard humans from the dangers which menace them when animals are sick, is the veterinarian. The importance of this medical authority is usually much underrated. He must be a person of intelligence and of integrity. Will Rogers has pointed out that the highest type of diagnosis has to be done by the veterinarian, since his patients are unable to tell what ails them.

An index to the slight estimate put upon the work of the veterinarian is contained in the fact that young men are not coming forward in sufficient numbers to take the places of the older men who drop out. If this suggests that veterinarians are underpaid, this in turn simply means that too little value is put upon their services.

Typhoid, tuberculosis, rabies, foot-and-mouth disease and a score of other ills would spread through our communities much more rapidly and destructively than they do now, if veterinarians were not alert to protect the public. Let us appraise their work at its full worth, and encourage more of our young men to enter this essential field of endeavor.

—*Boston Traveler.*

## COMMENCEMENTS

### UNIVERSITY OF GEORGIA

The commencement exercises of the University of Georgia were held June 20, 1928. The following graduates in the Division of Veterinary Medicine received the degree of Doctor of Veterinary Medicine:

Troy Benton Cobb  
Oswald Lamont Osteen  
Andrew Jackson Osteen  
James Luther Smalley  
Percy Marvin Spiers

Dr. Spiers was granted his degree at the end of the fall term.

### *Minneapolis, the Land of Hiawatha*

### MICHIGAN STATE COLLEGE

At the commencement exercises of the Michigan State College, held recently, the following graduates in the Division of Veterinary Science received the degree of Doctor of Veterinary Medicine:

Harry P. Cole  
Sidney A. Wells  
Clyde E. Dutton

The senior prize offered by the Michigan State Veterinary Medical Association was divided between Drs. Cole and Wells.

### *Minneapolis, City of Lakes and Gardens*

### PUBLICATIONS RECEIVED

- Soviet Union, Economic Statistics of the. Amtorg Trading Corporation, 165 Broadway, New York. March, 1928. pp. 78.
- Preliminary Report on the Experiment of the Aerobic Culture of Blackleg Bacillus and Its Protective Value. T. Takasawa. The Serum Institute of the Domestic Animal Disease, Taihoku, Formosa, Japan, 1927. pp. 28.
- A Treatise on Thuja and Colocynth. John Thomas Lloyd. Lloyd Bros., Pharmacists, Inc., Cincinnati, Ohio. pp. 28.
- Immunity or Resistance of the Chicken to Coccidial Infection. W. T. Johnson. (Sta. Bul. 230, Ore. Agr. Col. Exp. Sta., Corvallis, Ore., October, 1927. pp. 31.)
- New York State Association of Dairy and Milk Inspectors, First Annual Report of. Albany, N. Y., 1927. pp. 72.
- New York Women's League for Animals, Annual Report for 1927. New York, N. Y., 1927. pp. 94. Illustrated.

## ASSOCIATION MEETINGS

### CALIFORNIA STATE VETERINARY MEDICAL ASSOCIATION

The annual meeting of the California State Veterinary Medical Association was held at San Diego, June 11-13, 1928. Dr. J. P. Iverson occupied the chair and called the first session to order at 9:50 a.m. Dr. Iverson introduced Mayor Harry E. Clark, of San Diego, who gave a brief address of welcome. Dr. J. L. Tyler responded. The President's address was then delivered by Dr. Iverson.

The literary program was opened with the reading of a paper, entitled, "Facts, Figures and Statistics on the Operation of the Largest Hog Ranch in the world," by Dr. P. C. Guyselman, of Fontana. Dr. Guyselman gave a history of the Fontana Ranch Company, telling how the company took a contract with the City of Los Angeles for garbage delivered on railroad cars at Los Angeles for sixty cents per ton. The hog ranch occupies 240 acres and from 45,000 to 48,000 hogs are on feed at all times. The hogs are usually slaughtered at from eight to ten months of age, at which time they weigh approximately 200 pounds. Dr. Guyselman stated that the mortality at the ranch was about 10 per cent.

Dr. H. W. Graybill, of the California State Department of Agriculture, was the next speaker and presented a paper, entitled, "Activity of the Poultry Pathological Laboratory of Southern California." Dr. Graybill told of the importance of poultry work and advised veterinarians to study poultry diseases as much as possible. Dr. Graybill stated that during the two years that the laboratory has been in existence, fifty-one diseases, or conditions, have been observed and studied. The following were mentioned in the order in which they are most frequently found at the laboratory: coccidiosis, bacillary white diarrhea; mismanagement, including improper feeding, breeding, etc.; roundworms; cecum worms; tumors; paralysis; chicken pox; ruptured yolks; poisoning; fowl typhoid and fowl cholera. Dr. Graybill stated that no tuberculosis had been observed at the laboratory.

Monday afternoon was devoted to a sight-seeing trip. Members of the Association, wives and friends left San Diego shortly

after one o'clock, traveling southward by automobile across the Mexican border to Tia Juana. Tia Juana has proven to be a very famous resort since the adoption of the Eighteenth Amendment to our national Constitution became effective. Our first stop in old Mexico was at Baron Long's new hotel, which is not yet completed. This hotel contains a bar of very promising appearance, but as the hotel is still under construction nothing was being served and it was not long before some of the boys began singing, "How Dry I Am." Our next stop found the entire party seated in one of Tia Juana's most famous resorts where ample refreshment was secured. This apparently was enjoyed by all. The next stop was at the Foreign Club, a famous gambling place, where roulette wheels, "galloping dominoes," and many other gambling games were being operated. These games were played at tables stacked high along the edges with gold and silver money and many of our party tried their luck for a few minutes. Contrary to reports received from many sources, the entire party returned to San Diego in good condition, arriving about six o'clock. All agreed that the trip to old Mexico was a great success.

The business session of the meeting was held Monday evening, at which time regular routine business was conducted and the annual election of officers was held. This resulted as follows: President, Dr. E. H. Barger, Berkeley; vice-president, Dr. W. L. Edwards, Visalia; treasurer, Dr. D. F. Fox, Sacramento; secretary, Dr. W. L. Curtis, Los Angeles.

The annual report of the Secretary showed that there were 288 members, four of whom were dropped during the meeting and eleven new members admitted, bringing the total up to 295 at the time of adjournment. The annual report of the Treasurer showed a balance of \$1,372.45.

The Tuesday morning program was opened by Dr. A. G. Boyd, of San Diego, who read a paper, entitled, "Observations on Diseases of Captive Wild Animals." Dr. Boyd's paper brought out the fact that gastro-intestinal conditions, internal and external parasites, over-feeding by visitors, tuberculosis in monkeys, distemper in foxes and stomach ulcers in seals were all seen frequently at the zoo in San Diego. Dr. Boyd also mentioned the importance of testing horses for glanders in cases where horse meat is fed raw to wild animals.

Dr. K. G. McKay, of the Los Angeles County Live Stock Inspector's Office, presented a paper, "Atypical Reactors to the

Tuberculin Test." A very attractive feature in connection with Dr. McKay's paper was the exhibition of several models or moulds made to illustrate different reactions that are found in making intradermal tests for tuberculosis. Dr. Haring moved that the Association finance an exhibit of these moulds or models, to be shown at the A.V.M.A. meeting and some member of the Association, who was planning to attend the meeting, be delegated to demonstrate them. Motion was seconded and carried. It was agreed by all present that these moulds or models constituted one of the best demonstrations that have ever been given before the Association. Dr. C. M. Haring, of the University of California, presented a paper, entitled, "Accredited Abortion-free Herds." He outlined plans for the control of abortion and stated that the agglutination test for abortion is satisfactory.

Dr. A. P. Immenschuh, of San Diego, read a paper, "Use of Live Organisms in Control of Infectious Abortion at the San Diego County Farm." Dr. Immenschuh related his experience with abortion at the County Farm.

Dr. J. M. Arburua, of San Francisco, opened the afternoon program with the reading of a paper that had been prepared by Dr. H. B. F. Jervis, of Beverly Hills, on the subject of "Non-infectious Skin Diseases of the Dog." Owing to the absence of the author there was no discussion.

Dr. T. H. Agnew, of Pasadena, read a paper, "Canine Typhus." This paper and the discussion that followed brought out the following treatment for canine typhus. Use gastro-intestinal lavage, containing Epsom salt, sodium chlorid and bicarbonate of soda. Orally administer butter, cream or raw liver.

Dr. C. H. Zink, of Los Angeles, spoke on "Anaplasmosis." Dr. Zink told how the disease had been found in Los Angeles County. Dr. Karl F. Meyer, of San Francisco, opened the discussion. He spoke at considerable length on the disease. His description contained the very latest information regarding anaplasmosis. Dr. Meyer also spoke on canine typhus, stating that it was his belief that the condition is a deficiency disease.

Dr. J. M. Arburua presented a paper, entitled, "The Relation of the S.P.C.A. to the Practicing Veterinarian." Dr. Arburua's paper indicated that in certain localities S.P.C.A. hospitals are becoming a serious menace to the local practicing veterinarians. It was decided that one veterinarian from San Francisco, or vicinity, who is familiar with the conditions there, be added to the Resolution Committee and that a resolution be drawn to be

presented to the A.V.M.A. at Minneapolis, covering the S.P.C.A. hospital question.

A banquet was held at the Mission Beach Casino, Tuesday evening. Including the ladies, there were 120 in attendance. Entertainment and music for dancing were provided.

Wednesday morning, Dr. E. C. Jones, of Hollywood, presented a paper, entitled, "Advantages of a Diagnostic Laboratory in Connection with Small Animal Hospitals." Dr. Jones urged that all known methods be used in attempting to make correct diagnoses.

Dr. J. L. Tyler, of Pomona, presented a paper, entitled, "History of the Veterinary Profession of California." This paper was very interesting and in several places quite humorous. Many good laughs were indulged in while the paper was being read.

Dr. H. J. Achard, of Glendale, presented a paper, entitled, "The Endocrines in Pathogenesis and Therapy." Dr. Achard stated that eclampsia may be caused by improper activity of the liver and he suggested liver preparations and a liver diet as possible preventives. Dr. Achard also stated that eczema may be due to a thyroid deficiency and suggested that thyroid extract be tried in cases of eczema. He mentioned that placenta preparations will increase the secretion of milk.

The final paper on the literary program was presented by Dr. F. W. Wood, of Berkeley, entitled, "Observations on Canine Distemper." Dr. Wood mentioned the various biological preparations that are being used in the treatment of canine distemper and stated that some cases of intestinal distemper will sometimes recover rapidly, following the use of calf scour serum.

It was voted to hold the 1929 annual meeting at Sequoia National Park.

Wednesday afternoon was set aside for a visit to Balboa Park, where there is a zoo containing nearly 1700 animals, including birds.

W. L. CURTIS, *Secretary.*

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### STATE VETERINARY MEDICAL ASSOCIATION OF TEXAS

The eighteenth annual meeting of the State Veterinary Medical Association of Texas was held at College Station, June 18-22, 1928. In connection with the usual postgraduate work

given to the members of the Association by the faculty, practicing veterinarians of the State and outstanding lecturers were secured by the College to help with the program.

Dr. Mark Francis, dean of Veterinary Science, assured the visiting parties of their welcome and expressed confidence in the work being done in Texas today and his great pleasure at the good attendance.

Dr. R. P. Marsteller, the untiring genius of the College who makes the wheels turn and who makes everybody comfortable and happy, conducted a clinic the afternoon of the first day, on diseases and surgery of horses and mules. His work on epidural anesthesia, sterility, caudal myotomy, wound treatment, roaring, lameness and periodic ophthalmia is notable and his clinic was history-making. Dr. W. R. Sanderson, of Brownwood, spoke on salivary calculi.

The outstanding lecturer of the course was Dr. J. F. DeVine, of Goshen, N. Y., who lectured on diseases of the reproductive organs of cattle, diseases of the digestive organs and diseases of cattle and young cattle. He also held a clinic on diseases and surgery of cattle, diagnosis of pregnancy and treatment of sterility. Dr. DeVine proved to his delighted hearers that he has a proper fundamental knowledge of his work and was also a careful diagnostician, as well as giving careful directions as to treatment.

A very enjoyable program was carried out Tuesday evening, in joint session with the Ladies' Auxiliary. Dr. T. O. Walton being absent, Dr. R. P. Marsteller gave a gracious address of welcome. Dr. A. E. Flowers, of Dallas, responded with his usual fund of facts and information on practical lines, with the lighter vein interspersed throughout.

A paper by Mrs. U. E. Marney, of San Antonio, president of the Ladies' Auxiliary, drew much applause and favorable comment. Mrs. Marney showed by the able way in which she handled her subject that the women of the profession are alive to their responsibilities. Dr. M. E. Maier, of Orange, retiring president of the Association, gave an interesting talk and expressed much appreciation for the cooperation he had received from the members of the Association.

Mrs. R. P. Marsteller, loan fund secretary of the Women's Auxiliary to the A.V.M.A., gave a report of the meeting held in Philadelphia, in 1927. A humorous paper, called, "News of the Season," was read by Mrs. W. R. Sanderson, of Brownwood,

and was greatly enjoyed. The quips and quirks at the men caused even Dr. John Gillman to retire. Dr. DeVine closed the program with a speech to the ladies that was much applauded.

New officers of the Ladies' Auxiliary were elected as follows: President, Mrs. U. E. Marney, San Antonio; first vice-president, Mrs. R. P. Marsteller, College Station; second vice-president, Mrs. C. R. Covington, San Antonio; corresponding secretary, Mrs. W. R. Sanderson, Brownwood; secretary-treasurer, Mrs. D. Pearce, Leonard.

Dr. A. E. Wharton, of the college staff, spoke on "The Veterinarian in Public Health." Dr. Thomas O'Reilly, of the Federal Bureau of Animal Industry, Fort Worth, discussed "The Administration of Intradermic Tuberculin and the Interpretation of Reactions."

Dr. T. O. Booth, Laboratory Director, Live Stock Sanitary Commission of Texas, told of the Texas plan for eradicating contagious abortion. Dr. A. A. Lenert, of the college staff, talked on symptoms of fright disease in dogs, typhus of dogs, and diseases and surgery of small animals. He also covered anthelmintics for small animals. Dr. V. A. Scott, of the John Tarleton Agricultural College, Stephenville, gave some case reports.

"What Tick Eradication Means to the Live Stock Industry and the Veterinarian" was discussed by Dr. H. L. Darby, of the Federal Bureau of Animal Industry, Fort Worth.

Thursday afternoon, Dr. R. C. Dunn, of the college staff, held a clinic on poultry diseases, including contagious epithelioma, bacillary white diarrhea, fowl typhoid, internal parasites, coccidiosis, botulism, fowl paralysis, caponizing, collecting blood for serological tests, methods of administering medicines to poultry and postmortem technic.

Dr. J. D. Jones, of the Texas Experiment Station, and Dr. H. O. Von Rosenberg, of the Live Stock Sanitary Commission of Texas, held a clinic on diseases and surgery of sheep and goats. The Association regrets very much to learn that Dr. Jones will soon leave the College. They feel that his going will be a great loss to the State as well as to the College.

Dr. W. M. Smotherman, veterinarian to the Penitentiary System, Huntsville, demonstrated the use of the emasculatome.

Other phases of the meeting were the advantages that the veterinarians had for consulting members of the faculty, as well as Dr. DeVine, on special lines of work. The course was voted more than good. The practicing veterinarians of the State

were called on and responded ably and gave valuable demonstrations. The program was largely in their hands and much credit is due them.

At the business session, the following officers were elected: President, Dr. M. E. Gleason, San Antonio; first vice-president, Dr. Y. J. Aiken, Lubbock; second-vice-president, Dr. W. R. Hodges, Ranger; secretary treasurer, Dr. D. Pearce, Leonard.

D. PEARCE, *Secretary.*

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***Minneapolis, the Gateway to the  
Ten Thousand Lakes Region***

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**MISSOURI VETERINARY MEDICAL ASSOCIATION**

The annual meeting of the Missouri Veterinary Medical Association was held at Carthage, June 26-28, 1928. Headquarters were at the Drake Hotel. All sessions were held in the hotel except the clinic, which was held in the arena of a large sales barn a short distance from the hotel. More than 100 veterinarians from Missouri and neighboring states were in attendance.

The meeting was called to order by the President, Dr. F. C. Cater, of Sedalia, at 11:00 a. m. Mr. Allen McReynolds, of Carthage, delivered the address of welcome. Dr. H. A. Wilson, State Veterinarian, responded. A short business session followed the President's address.

Dr. J. L. Jones, of Blackburn, gave some very interesting case reports that brought out a good discussion.

The afternoon session opened with a talk by Dr. D. B. Morgan, of Neosho, one of the oldest veterinary practitioners in America. He gave a few "Pointers in Horse Practice" that had been gleaned from a wide experience throughout the world. "Sit Fasts or Sore Necks and Their Sequelae," by Dr. J. B. Rand, of Bunceton, brought out many practical points. Dr. Ashe Lockhart, of Kansas City, gave a good discourse on anaphalaxis, as observed in the field, following the use of various biologics.

Dr. C. R. Walter, of Tulsa, Okla., was a visitor and favored the Association with a practical discourse on "Parasites, Symptoms and Treatment in Dogs and Cats." Dr. Walter also conducted an interesting round-table discussion on small-animal practice. The subject of rabies was handled by Dr. C. E. Salsbery, of Kansas City. The rabies situation in this and other countries was stressed by the speaker.

For the evening, the local committee had arranged for the use of the Royal Theatre. The Association attended in a body and the entire community was invited to see two B. A. I. films: "T.B. or Not T.B.," dealing with avian tuberculosis and its control, and "This Little Pig Stayed Home," dealing with hog cholera control. Both films are good and encourage the use of veterinary service.

The local committee, headed by Dr. W. J. Houser, of Carthage, as chairman, assembled the most elaborate bunch of material for the clinic that has been seen at any meeting in recent years. The following will give an idea of its scope:

*Equine clinic:* Three ridgling horses were castrated; one horse operated on for fistula of the withers; one case of well-developed glanders in a mule was presented and the diagnosis confirmed by ophthalmic and intrapalpebral mallein tests; four other equines were presented for observation and diagnosis.

*Bovine clinic:* Enucleation of the eye from two cows; teat operations on four cows; one cow presented for observation and diagnosis.

*Swine clinic:* Two pigs operated upon for scrotal hernia; one hog operated upon for perineal hernia; one case of chronic rhinitis in the pig was presented.

*Canine clinic:* Twelve dogs affected with various ailments were presented. One very interesting operation for entropion was performed on a dog by Dr. L. G. Clark, of Los Angeles, Calif., who was a visitor in his old home state of Missouri.

*Poultry clinic.* In addition to the above, about twenty-five fowls with conditions commonly found in a country practice were submitted to autopsy. Postmortem was held on one sheep. Several animals were on the picket line for observation and examination, but were not reached due to a lack of time.

The annual banquet was served in the large hall of the Drake Hotel, with 135 veterinarians and friends in attendance. One of the appealing things about the banquet was the menu, which featured half a fried chicken with all the Ozark trimmings for the price of \$1.00. The principal talk of the evening was made by Dr. H. A. Wilson on the subject, "Tomorrow."

The program of the third day was opened with a business session. Twenty-five new members were added to the roll. Various committee reports were received and then the program was continued.

The committee in charge of the Missouri Veterinary Medical Association building, to be located in the State Fair Grounds, made a report to the effect that plans had been completed, contracts let and the work on the structure had been started. The building will be completed before the Fair this fall.

Dr. R. R. Gloyd, of Butler, gave an interesting discourse on "The Vicissitudes of Country Practice." Dr. J. H. Bux, state veterinarian of Arkansas, was a visitor and favored the Association with a paper, entitled, "Arkansas Animal Industry Problems."

The subject of "Farming and Beef Cattle" was handled in a unique manner by Mr. Franklin Greenwood, a dirt farmer, of Carthage. "What More Dairying in Missouri Means to the Veterinarian" was the subject of Mr. E. G. Bennett, dairy commissioner of Missouri.

Dr. Ashe Lockhart, of Kansas City, gave an extemporaneous talk on "Anaplasmosis." This disease appears to be widespread throughout the Southwest. Dr. R. C. Moore, of St. Joseph, made one of his very instructive talks on "Surgical Diseases of the Udder of Dairy Cows." A round-table discussion on "Problems in Dairy Practice" was conducted by Dr. J. L. Wells, of Blue Springs.

Officers for the coming year were elected as follows: President, Dr. J. L. Wells, Blue Springs; vice-president, Dr. W. J. Houser, Carthage; secretary-treasurer, Dr. J. D. Ray, Kansas City.

J. D. Ray, *Secretary*.

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### ***Minneapolis, the Metropolis of the Northwest***

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#### **VERMONT VETERINARY ASSOCIATION**

The twentieth annual meeting of the Vermont Veterinary Association was held at Burlington, July 10-11, 1928, with about twenty members present and visiting veterinarians from Vermont, New Hampshire and Massachusetts.

The meeting was called to order, at two o'clock, the first day, by President R. C. Goss, of Middlebury. Officers for the coming year were elected as follows: President, Dr. C. M. Miller, Orwell; vice-president, Dr. A. D. Spooner, Barre; secretary-treasurer, Dr. G. N. Welch, Northfield.

The Necrology Committee made a report of the death of one member, Dr. Herbert S. Perley, of Hanover, N. H., during the

year, and they paid a very touching tribute to this beloved member. Dr. Goss delivered a very able address upon retiring as president.

Papers were then read by Dr. C. M. Miller, of Orwell, on "Anesthesia and Necrosis." This paper was very instructive and interesting and brought out a good discussion. Dr. George Stephens, of White River Junction, presented a paper on "Professional Ethics in Practice." This created quite a heated discussion. Dr. F. A. Rich, of the Vermont Agricultural Experiment Station, Burlington, then gave a very able talk on "Udder Diseases." Special stress was placed on preventive measures.

Adjournment was then made to the Steamer "Ticonderoga," which left the wharf at 5:30. About fifty members and friends enjoyed the beauties of Lake Champlain and its sunset until 10:30 p.m. At six o'clock all repaired to the attractive dining-room of the boat and fully satisfied the inner man.

Wednesday morning, at nine o'clock, all took autos and went to Fort Ethan Allen, where Colonel F. A. Hopkins, Post Commander, met all with a hearty hand clasp and a few genial words of welcome. Capt. James E. Noonan, Post Veterinarian, then conducted the party through the stables to the Post Hospital, where short clinics were held and Capt. Noonan read a very interesting paper, entitled, "Veterinary Service of the Army."

Dr. W. R. Hinshaw, of the Massachusetts Agricultural College, Amherst, gave a short but spicy talk on "The Veterinarian and Poultry Diseases." Questions and discussion followed and a rising vote of thanks was given Capt. Noonan and Dr. Hinshaw for the hospitality of the post and the papers.

It was decided to hold the 1929 meeting in Montreal, in mid-summer. This was a very enjoyable and profitable meeting, thanks to Dr. and Mrs. J. A. Rust. Dr. Rust acted as chairman of the local Committee on Arrangements.

G. N. WELCH, *Secretary.*

### ***Minneapolis, the Youngest City of Its Size in the World***

#### **KENTUCKY VETERINARY MEDICAL ASSOCIATION**

The regular annual meeting of the Kentucky Veterinary Medical Association was held at Henderson, July 11-12, 1928, with headquarters at the Soaper Hotel. The address of welcome was delivered by Hon. M. D. Eblen, mayor of Henderson, and was responded to by Dr. A. S. Barnes, of Frankfort.

The presidential address was given by Dr. T. P. Polk, of Lexington, and Dr. C. G. Kreidler read the minutes of the previous meeting and rendered his report as secretary-treasurer.

The first paper on the program was presented by Dr. W. W. Dimock, of Lexington, entitled, "Eradication of Abortion." This subject was discussed by Dr. R. T. Jett, of Hopkinsville, and Dr. C. E. Palmer, of Shelbyville. The meeting adjourned for luncheon and the afternoon session commenced at 1:30 with Dr. F. H. Brown, state veterinarian of Indiana, as the first speaker, his subject being "Cooperation in Disease Control Work." A paper entitled, "Special Problems in Disease Control Work," was presented by Dr. D. E. Westmorland, state veterinarian of Kentucky, and the discussion opened by Dr. W. F. Biles, of Frankfort.

Dr. Benj. Schwartz, of the U. S. Bureau of Animal Industry, Washington, D. C., delivered a paper on "Gastro-Intestinal Parasites of Equines and Their Control," which was followed by a paper on "Hospitalization Methods for Both Medical and Surgical Cases," presented by Dr. J. H. Snook, of Ohio State University. This subject was discussed by Dr. E. Calldemeier, of Louisville; Dr. Harry Gieskemeyer, of Newport; and Dr. R. W. Youngblood, of Henderson. Dr. J. C. Melvin, of Mayfield, spoke on "The Importance and Reliability of the Agglutination Test for Bacillary White Diarrhea of Fowls."

The evening session opened with a moving picture showing the production of serum and virus. This was discussed by Dr. J. L. Kixmiller, of Indianapolis. A general discussion on hog cholera and swine diseases followed by Dr. W. M. Coffee, of La Center, and Dr. K. H. Beyer, of Henderson.

The second day, Dr. R. W. Youngblood conducted a clinic held at his hospital. A demonstration of pathological specimens was conducted by Dr. R. H. Nutt, of Henderson, and some special surgical methods were demonstrated by Dr. Snook, assisted by Dr. Beyer and Dr. Coffee.

The election of officers resulted as follows: President, Dr. A. J. Kay, Frankfort; first vice-president, Dr. C. E. Palmer, Shelbyville; second vice-president, Dr. F. H. Riester, Buechel; third vice-president, Dr. E. M. Stemmler, Lexington; secretary-treasurer, Dr. C. G. Kreidler, Maysville.

The next meeting will be held in connection with the Veterinarians' Conference at the Agricultural Experiment Station, Lexington, January, 1929.

A barbecue was held at Atkinson Park, at 1:30, after which the meeting adjourned.

C. G. KREIDLER, *Secretary*.

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***Minneapolis, America's Vacation City***

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**PERSONALS**

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**MARRIAGES**

Dr. O. C. Lynch (Cin. '18), of Statesville, N. C., to Miss Grace Wilson, of Newton, N. C., June 20, 1928.

Dr. Harry B. Steinbach (U. P. '27), of Norristown, Pa., to Miss Rosalie Camilla Monshower, of Valley Forge, Pa., June 23, 1928, at Valley Forge.

Dr. A. E. Hilbert (Corn. '27) to Miss Ruth Carlton, June 28, 1928, at Danby, N. Y.

Dr. K. F. Hilbert (Corn. '28), of Farmingdale, N. Y., to Miss Evangeline Baylor, of Danby, N. Y., June 28, 1928, at Danby, N. Y.

Dr. A. W. Nyline (Iowa '25), of Hinkley, Minn., to Miss Sarah Ashley, of Clinton, Ill., July 2, 1928, at St. Paul, Minn.

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***Minneapolis, the 1928 Convention City***

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**PERSONALS**

Dr. Vernon B. Overman (Iowa '28) has located at Winchester, Ind.

Dr. John D. Shoeman (K. S. A. C. '28) has located at Bussey, Iowa.

Dr. R. L. Elsea (K. S. A. C. '28) has opened an office in La Monte, Mo.

Dr. S. H. Hopson (Corn. '28) has located for practice at Massena, N. Y.

Dr. J. P. McIntosh (Corn. '28) has selected Dolgeville, N. Y. for a location.

Dr. Alan Bachrach (U. P. '28) is located at 5449 N. 11th St., Philadelphia, Pa.

Dr. G. J. Goubeaud (Corn. '28) has gone into private practice at Flushing, N. Y.

Dr. Bert J. Cady (Corn. '04) has removed from Delmar, N. Y., to Voorheesville, N. Y.

Dr. B. A. Zupp (Iowa '23) has removed from Blue Earth, Minn., to Wal-  
tham, Minn.

Dr. V. H. Miller (O. S. U. '24), formerly located in Toledo, Ohio, is now at  
Marengo, Iowa.

Dr. C. J. Noonan (Corn. '28) is associated with Drs. Miller and Zepp, of  
New York City.

Dr. Roy L. McConnell (K. S. A. C. '28) has located at 714 West 8th St., Coffeyville, Kans.

Dr. Vilo T. Rose (K. S. A. C. '28) has selected Elkton, Ky., as a suitable location for practice.

Dr. Lloyd Darst (Iowa '28) has accepted a position with the Peoria Veterinary Hospital, Peoria, Ill.

Dr. W. A. Kelly (Corn. '28) has accepted a position at the North Shore Animal Hospital, Evanston, Ill.

Dr. K. F. Hilbert (Corn. '28) is located at the State Institute of Applied Agriculture, Farmingdale, N. Y.

Dr. R. V. Westerberg (Ont. '27), formerly of Simsbury, Conn., is now practicing in New Britain, Conn.

Dr. S. H. Exley (Ga. '24), formerly of Cleveland, Tenn., has selected Lebanon, Tenn., as a better location.

Dr. L. W. Messer (Corn. '28) has accepted a position at the Hinckley Veterinary Hospital, Buffalo, N. Y.

Dr. H. P. Cole (Mich. '28) has opened a small-animal hospital in Saginaw, Mich. His address is 1518 N. Michigan Ave.

Dr. M. C. Hawn (Iowa '27) formerly of Johnson, Nebr., is now located in Madison, Wis. Address: 1113 West Johnson.

Dr. W. E. Ulmer (Corn. '28) is with the New York Women's League of America, 350 Lafayette St., New York, N. Y.

Dr. Chauncey D. Maulfair (Chi. '02) has resumed practice at Granville, Ill., after having been disabled for the past few years.

Dr. T. B. Burris (O. S. U. '24), formerly of Los Angeles, Calif., is now in practice in Bridgeport, Conn. His address is 336 State St.

Dr. Carl L. Martin (O. S. U. '28) has located in Southbridge, Mass., where he has taken over the practice of the late Dr. William T. Pugh.

Dr. G. M. Jones (K. C. V. C. '13) is in charge of the Tex Austin ranch at Rowe, N. Mex. Dr. Jones was formerly located in Las Vegas, N. Mex.

Dr. R. E. Nichols (Corn. '28) has accepted an appointment in the Small Animal Clinic, New York State Veterinary College at Cornell University.

Dr. Thomas H. Edwards (K. C. V. C. '09), formerly located in Pasadena, Calif., has removed to Los Angeles, Calif. Address: 5217 Huntington Drive, N

Dr. G. O. Smith (McK. '08) has been re-appointed Woodford County (Ill.) Veterinarian. This action was taken at a special meeting of the County Board recently.

Dr. C. L. Woolard (Chi. '17), of Benton, Ill., has been appointed Montgomery County (Ill.) Veterinarian by the Board of Supervisors, at a salary of \$3600 per year.

Dr. Charles J. Parshall (Corn. '28) has accepted an appointment at the North Dakota Agricultural College, Fargo, where he will engage in teaching and research work.

Dr. J. E. Pyle (Chi. '07), of Toulon, Ill., recently received an appointment in the Illinois State Department of Agriculture. He will be engaged in tuberculosis eradication work.

Dr. L. H. LaFond (Mich. '23), formerly of Flint, Mich., has removed to Detroit, Mich. He announced the opening of the LaFond Veterinary Hospital, 3191 W. 8-Mile Road, on June 25.

Dr. G. W. Hess (Chi. '07) recently resigned his position as Montgomery County (Ill.) Veterinarian, to accept a similar position in McHenry County (Ill.). Dr. Hess will be located at Woodstock, Ill.

Dr. E. D. Modlin (Ind. '15), of Cambridge City, Ind., was able to resume his practice recently, following a period of enforced idleness after undergoing an operation at the U. S. Naval Hospital, in Chicago.

Dr. J. F. Gillespie (Ont. '96), of Tuscola, Ill., sustained painful injuries in a collision between an interurban car, on which he was riding, and an automobile, driven by a drunken driver, in Danville, Ill., recently.

Dr. H. M. Williams (K. C. V. C. '11) has resigned his position with the Bureau of Animal Industry and has located for practice at Ferndale, Wash. Dr. Williams took his state board examination at Pullman, June 12 and 13.

Dr. I. D. Wilson (Iowa '14), of the Virginia Polytechnic Institute, Blacksburg, Va., has been spending the summer in the Department of Zoology and Entomology at Iowa State College, taking postgraduate work in protozoology.

Dr. W. E. Russel (Chi. '20), of North East, Pa., read a paper on "The Breeding Problems of the Silver Black Fox," at the summer meetings of the American Fox Institute, held last month at Denver, Colo., and also at Salt Lake City, Utah.

Dr. H. Van Roekel (Iowa '25) has accepted a position with the Fish and Game Commission of California. He is now engaged in research work with diseases of fish and wild game, at the George Williams Hooper Foundation for Medical Research, at San Francisco.

Dr. Lewis H. Moe (O. S. U. '27), who has been at the Ohio State University the past year, has accepted an appointment as assistant professor in the Department of Bacteriology and Veterinary Medicine of the Oklahoma A. & M. College, at Stillwater. Dr. Moe plans to attend the meeting in Minneapolis on his way west.

Dr. B. L. Strohl (Ind. '08) has been appointed Edgar County (Ill.) Veterinarian for the coming year. The past year Dr. Strohl had two counties in his charge, Edgar and Coles, but, having found it impossible to cover two counties efficiently, he will have only Edgar County the coming year. Another veterinarian will be appointed for Coles County.

Dr. L. J. Proper (Chi. '05), of San Diego, Calif., has leased his small animal hospital to Dr. F. J. Bolander (U. S. C. V. S. '14). Dr. Proper still retains his position as City Milk Inspector of San Diego. Dr. Bolander subsequently turned the hospital and practice over to Dr. H. L. Simpson (McK. '12), Dr. Bolander going to Los Angeles to accept a position with the California Department of Agriculture.

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***Minneapolis, the Financial, Wholesaling, Jobbing, Retailing, Manufacturing, Distributing, Educational, Cultural Metropolis of the Northwest***

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